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MONOGRAPH

ON THE

CARPET WEAVING INDUSTRY

OF SOUTHERN INDIA

With thirty plates.

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BY

HENRY T. HARRIS.

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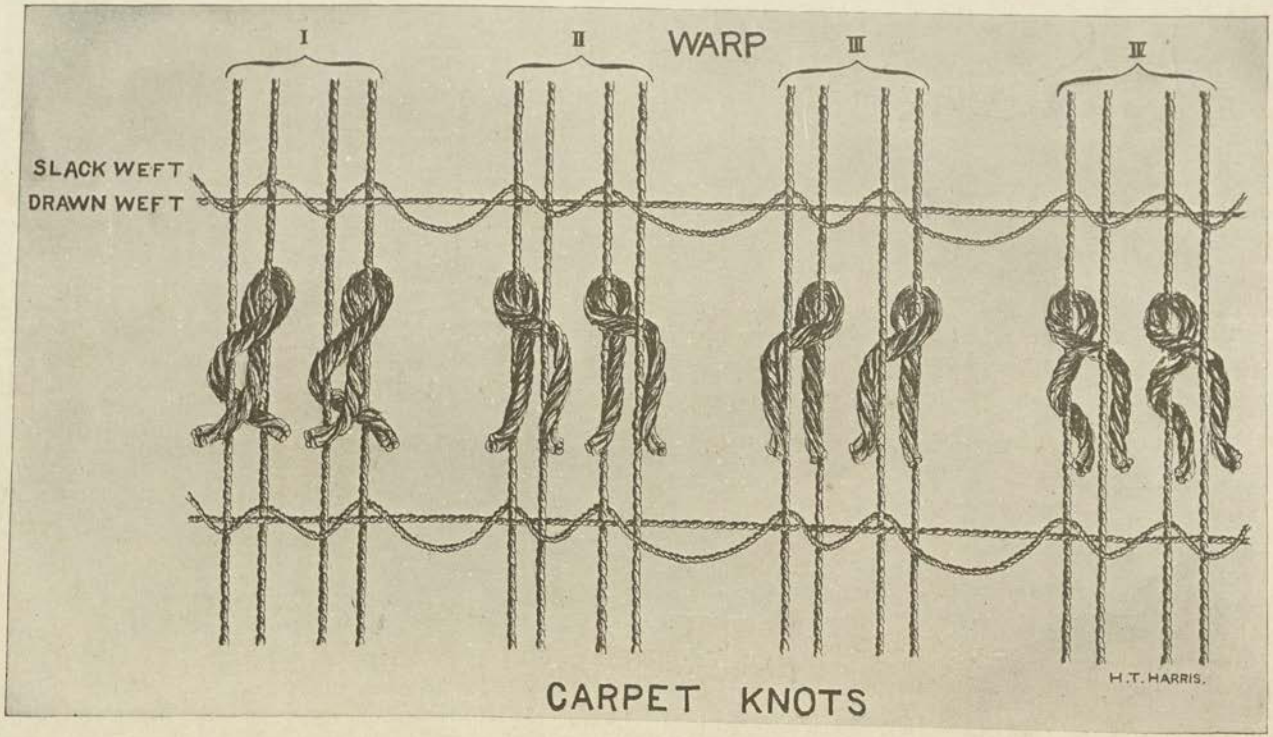

CARPET KNOTS

MONOGRAPH

ON THE

CARPET WEAVING INDUSTRY

OF

SOUTHERN INDIA

WITH THIRTY PLATES

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HENRY T. HARRIS.

MADRAS:
PRINTED BY THE SUPERINTENDENT, GOVERNMENT PRESS.

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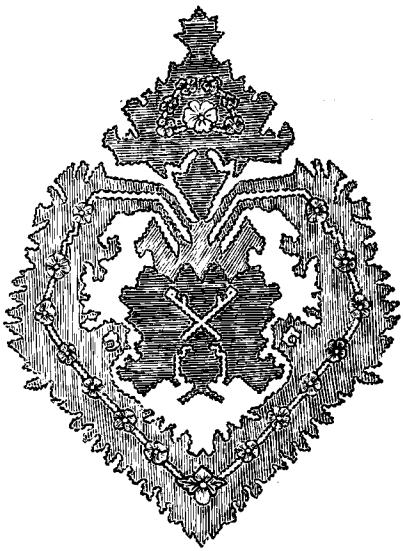

A bit of the pattern of an Ellore Carpet, of Moghlai origin; appears also in Bangalore Carpets.

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INTRODUCTION.

I SUPPOSE I was asked to write this monograph partly because I have had a fairly long and intimate acquaintance with the carpet industry as practised in India, and also because I have shown a good deal of sympathy with that poor, quiet, law-abiding class—the carpet weavers.

It is perhaps unfortunate that I have had little experience of the industry in Southern India, as practised outside Madras, my personal knowledge of it having been confined to flying visits to Ellore, Walajanagar, Vellore and Bangalore.

I have tried to make this monograph a practical working handbook to the South Indian carpet industry, giving special prominence to the preparation and dyeing of the wool, for this appears to me to be the direction in which the industry needs most attention.

Sir George Watt's 'Dictionary of Economic Products' and 'Dyeing and Dye Stuffs' will prove of much value to those interested in dyeing, although scarcely any of the formulæ I have given will be found in those most useful works.

I desire to express my gratitude to Mr. Edgar Thurston for much valuable help, and to Mr. W. F. Grahame, I.C.S. (retired), for kindly revising my proofs.

HENRY T. HARRIS.

Ornament in the pattern of an old "Coast" carpet. A somewhat similar device, without the latch hooks and Vaishnavite symbols, appears in one of the Lahore designs, and is illustrated in the 'Journal of Indian Art,' Vol. XI.

The Carpet Weaving Industry of Southern India

SOME NOTES ON THE HISTORY OF ORIENTAL CARPETS.

CARPETS date from a very remote period. We read of their being applied to sacred uses by the priests of Heliopolis, and as ornamenting the palaces of the Pharaohs. On state occasions they were placed on the couches of the guests attending royal feasts.

The Bible tells us that the Babylonians were skilled in weaving in divers colours, the designs comprised fabulous animals, and attempts to trace the human form.

Of King Solomon's great temple to the Most High, we read, in the Books of the Kings and the Chronicles, of curtains and veils [purdhas] twined of linen, and blue, and purple, and scarlet, with cherubims of cunning work, wrought with needle work; of wool, of goats' hair, and of rams' skins, dyed red. To-day in Central Asia, Persia and Turkey one often finds carpets in use as hangings in Syrian, Roman, Armenian and Coptic churches, in mosques, and in private residences and public buildings.

An ancient Jewish legend tells us that Naameh, the sister of Tubal Cain and the daughter of Lamech, invented wool-spinning and cloth-weaving. Purple Babylonian carpets are mentioned as having been spread over the grave of Cyrus "the Great."

On the Beni-Hassan rock-tombs in Upper Egypt, which date from about B.C. 2500, are to be found pictures of working weavers. On one of them is a vertical loom; a woman at a distaff is twisting flax or wool into thread with a spindle; near them is the master or head workman superintending the work. Another wall picture shows a man weaving a rug on a horizontal loom. The Nineveh marbles have sculptures of Kurdistani-like rugs in quite modern style, bordered with rosettes and latch-hooks, and bearing the Tree of Life in the centre.

The sacred writings of the Hindus contain frequent references to carpets, but these were probably cotton, silk or wool, woven into what are now known as "Daris," pileless carpets, usually worked upon a horizontal loom.

Pliny writes of the skilled Assyrian weavers, their wonderful colour ideas, and the antiquity of the Art in his time. He tells us that even in his day, the name "Babylonica peristromata" had come to mean "the perfect weaving of a perfect weaver," and a corrupt form of that old name remains to-day with the weavers of the Levant, as the sign and seal of perfect work. Diodorus speaks of the carpets of woven work upon which lay the Egyptian sacred bulls. Homer in the 'Odyssey' tells us of

> "Fair thrones within from space to space were raised,
> Where various carpets with embroidery blazed,
> The work of matrons."*

* Pope's 'Odyssey.'

Herodotus, Strabo, Æschylus, Plautus, Metellus, Scipio, Horace, Lucan, Flavius Josephus, Arrian, and Athenæus, all frequently mention carpets, and almost every other Greek or Latin author whose work time has spared, tells of this splendid old loom-work. Constantinople was a great seat of the textile industry, and was specially famous for its weaving in wools, which were of great beauty and prized accordingly. The Greeks had carried their own skill in the textile arts to their colony at Byzantium, whither had also drifted the loom and needle work peculiar to India, Persia and China.

From Assyria carpet-weaving found its way to Greece and Rome, and later to Western Europe. Thus right down the ages the loom of conquest and commerce flung its shuttles in "rich caravans and argosies" to and from Imperial Rome, and afterwards Byzantium, for the East remained the fountain head of rich colour and beautiful design, and the home of the textile art.

Abbot Egelric of Croyland, who died A.D. 992, bestowed on his Church two large Pedalia, Pede-cloths or foot cloths [as carpets were then called] "woven with lions," to be laid out before the High Altar on great festivals, and two shorter ones, "trailed over with flowers," for the feast days of the Apostles.

In an old inventory in Exeter Cathedral we find in a list of the bench coverings of the choir, A.D. 1327, this mention of an English-made carpet with a fretted pattern:—"unum tapetum magnum Anglicanum frettatum." Exeter Cathedral had also a carpet, the gift of Bishop Lacy, A.D. 1420, besides two large carpets, one bestowed by Bishop Nevill, A.D. 1456, and another, in chequered pattern, given by Dame Elizabeth Courtenay about the same date.

In the South Kensington Museum is a small, but most unmistakable piece of Hispano-Mauresque carpeting, which Dr. Rock attributes to the late XIV Century. The ground is red, still full of brightness and life; its rich green quatrefoils bear three white animals. The museum also has two pieces of Spanish XVI Century carpets with red grounds, and pomegranate boughs, flowers, and fruit, in blue and yellow, with barbers' pole borders of yellow and red and blue and yellow.

Queen Eleanor of Castile brought into England, in the XIII Century, some of the magnificent rugs woven in Granada and Cordova. They were then known as "Carpets of Baldechino" = Baldechine = Baghdad; probably because the industry was believed to have originated in that city.

Even the bitter warring of the Crusades created in Europe a desire for the luxuries of the Orient as they became known. The Arab carried with him into Southern Europe a new industry, and in Granada and Cordova the Saracen weavers made magnificent carpets both for their Emirs and for trade.

We learn that in the reign of King Edward V, before the throne and the Communion Tables were—

> "Carpets full gay,
> That wrought were in the Orient."

The really interesting narrative of that "God-fearing pirate," Juan Fernandez Pinto, shows how piously and boldly the "Portugalls" of his day [XVI Century] cruised round both coasts of India and the Far East generally, picking up such trifles as inadequately armed ships with their cargoes of cloth, ivory, and spices belonging to the Infidel, and, no doubt, also attended to their own needs in the sacking of ill-guarded towns, and then offered up long prayers of thanksgiving to the Almighty, if they got clean away with whole skins and a valuable haul. Doubtless some of the old South Indian carpets may still be found in the cathedrals, churches and old homes of the rich and noble in Southern Europe, which were got through the exertions of these estimable gentlemen.

Efforts were made to introduce the Oriental carpet industry into England, in the reign of King Henry VIII, upon the mode of working in vogue in the East, but very little progress seems to have been made until nearly the end of the seventeenth century. This, only partly successful, no doubt led at a much later period to the introduction of the manufacture of English pile or loop carpets, such as those of Axminster, Kidderminster, Glasgow and Wilton.

Later on, at Kelmscott House, Hammersmith, and afterwards at Merton Abbey, Surrey, William Morris commenced the manufacture of carpets upon purely Oriental lines, the designs, his own, being all modifications of some of the best of the old Persian and Indian patterns. The looms of the East never turned out anything more beautiful in colouring, pattern and weave, for the dyers and weavers, inspired by Morris' own energy and art instinct, worked with head and hand, as did the Eastern workers of old time. The dye drugs were, with few exceptions, culled from English fields, and moors and woodlands. Morris never used a large range of colours; he got with a few tints all his effects by skilful arrangement and contrasts. Writing in 1875 he lists "two blues, a blue-green, two greens, two yellows, one brown, a black," "a shade or two of rust yellows or buffs," and says, "with the above I can carry out any design that did not need the madder colours, and setting indigo apart." He re-discovered the "art of weld [*Reseda luteola*]; dyeing, the ancientist of yellow dyes and the fastest" and several of the reintroduced pastel dye colours are due to him.

In his essay, 'Dyeing as an Art,' Morris tells of his struggles after the old colourings. Pliny shewed him old methods; such books as Gerard's Old English Herbal, Fuchsius [Basle 1543], Mathiolus [Venice 1590], Hellot's Wool Dyeing [Paris 1750] were among his tutors for dye-stuffs and methods; and Mr. George Wardle, speaking of his work at that time [1875], says, "I do not think a single dyeing went wrong, nor was any appreciable quantity of yarn wasted." The "Morris" factory still exists at Merton Abbey, and turns out some excellent work, both hand-loom and power, but little, I fear, equal to that produced during Morris' own time.

Excellent hand-loom carpets are now made in Scotland and Ireland. Much of the dyeing of these is done with locally grown vegetable dye stuffs, but in some that I have seen "the mark of the beast" aniline is plainly in evidence.

CARPET WEAVING IN SOUTH INDIA.

"They make likewise excellent carpets of their wools in fine mingled colours, some of them more than three yards broad, and of a great length. Some other richer carpets they make all of silk, or of silk and wool, so artificially mixed that they lively represent those flowers and figures made in them. The grounds of some other of their very rich carpets are in silver and gold, about which are such silken flowers and figures as before I named, most excellently and orderly dispos'd throughout the whole work."—'A Voyage to East India' by the Reverend Edward Terry [Chaplain to Sir Thomas Roe, Ambassador to the great Moghul], 1615–17. *London*, 1655.

Sir George Birdwood asserts, with apparent good reason, that the manufacture of pile carpets was probably introduced into India by the Saracens. The authentic history of the Carpet Industry in South India commences in 1679, and proves fairly conclusively that the art came from Persia more than a hundred years previously. I extract the following from, "A Memoriall of Streynsham Master Esquire, Agent ot the Coast and Bay

of Bengall, his journey from Fort Saint George—Madraspatnam, to Metchlepatam and parts, to visit those factorys, &c., 1676–79" :—

"*March 14th*, 1679.—The Agent, &c., went to visit the Dutch at Pollicull this evening which is about 7 miles inland from Madapollam, there the Dutch have a Factory of a large compound, where they dye much blew cloth, having above 300 jars set in the ground; for that worke also they make many of their best paintings there." [Undoubtedly Coromandel chintz cloths, of which Bernier writes in 1663, "Cloths painted by a pencil of Masulipatam, wrought and contrived with such vivid colours and flowers, so naturally drawn, that one would have said it was a parterre."—H. T. H.]

"*March 19th*, 1679.—We sett forward early in the night and by 9 or 10 in the morning come to Elloor three gentue leagues, this Elloor is reckoned one of the greatest Townes in this country, your King in his last progress coming to see it, [Abū'l Hassan Shāh, last of the Qutb Shāhī Dynasty of Golconda. He visited Masulipatam on the 17th of January 1676.—H. T. H.] where are made your best Carpetts, after the manner of those in Persia, by a race of Persians, which they told me came over above 100 yeares ago, the manner of making them we saw, and is in brief thus; the loome is streached right up and downe made of Cotton thread and the Carpett wrought upon them with the woollen yarne of severall collours by young boyes of 8 to 14 yeares old, a man with the Patterne of the worke drawne upon paper standing at the back side of the Carpett, and directing the boyes that worke it, how much of each collour of yarne should be wrought in and every thread being wrought they share it with a pair of sizors and then proceed to the next."

This appears to me to be quite satisfactory evidence that carpet weaving was being carried on at Ellore so far back as about 1550, and Orme mentions a tradition that Masulipatam was founded in the fourteenth century by a number of Arabs, who arrived on the coast accompanied by their wives and families.* Orme also tells us that "the city is, even at this day, a place of considerable trade and resort, and famous for its manufactures of painted cloths; for the plants from which the dyes are extracted grow nowhere in such perfection as in the adjacent territory." The first mention of Masulipatam in history is a sanction to Arabs to build a mosque, which was granted by the tolerant Carnatic Rajahs about 1425 A.D.

We may assume therefore with some reason that the industries in Ellore and Masulipatam actually date from about the middle of the fifteenth century, although Streynsham Master makes no mention of the industry in his "Memoriall" when writing of Masulipatam.

Baldæus, in his book, "A description of Ye East Indian Coastes of Malabar, and Coromandell." *Amsterdam*, 1672, speaks of the City of Masulipatam as "very populous" and tells of "the large English and Dutch Factories" there, he also says, "The Governour pays a certain tribute to the King of Golconda, which he squeezes out of the inhabitants especially the *Gentues*, who are sorely oppress'd by the Persians and Moors, who farme all the weaving trade from the Great Patrons." This note on Masulipatam appears to have been written about 1636.

Baldæus thus mentions Chay root.—"Esaye Root is a small root no bigger than a little sprig, of about a span in length, used by the Dyers. The way to test its goodness is to break it into pieces, and to see if it be very red within, or else to chaw a piece of it, and if you perseive a nitrous taste it is good." Dr. Fryer, 1672–81, says, "The roots from Petaipouli [? Nizámapatam] on the dyed and painted stuffs exceed even those of Masulipatam. The collour thereof is so deep that they are obliged to use it with the Esaye of Aricall [? Arikatla] and Ortacour, to make it the more lively."

* Kistna District Manual, 1883.

AYYAMPET IN THE TANJORE DISTRICT,—we know little more of the history of carpet weaving there than that it was, in the Hon'ble Company's time, the centre of the rug industry for which the district was once famous. Mr. E. B. Havell, in his report 1885–88, tells us that "ten years ago 107 families were employed in the industry, now 12 families only are employed in it."

Ayyampet has always been noted for its silk carpets, and it is not so very long ago that the export of them touched over a lakh of rupees annually. There is no doubt that this industry is now almost dead, and it is doubtful whether there are any men left who possess the old dye secrets. The few modern silk carpets made at Ayyampet which I have seen were very coarse, not more than 6 or 7 stitches to the inch, and, with the exception of the blues, were all dyed in aniline colours, and these were by no means skilfully applied. The Tanjore District Gazetteer, 1906, says of the Ayyampet carpets that:—"the cheaper jail-made woollen rugs have destroyed the industry there, woollen carpets are rarely made, and silk ones never except to order. Both are excellent in quality, especially the latter, but the colour combinations are not always pleasing. The warp is of thick cotton thread, and the woof usually of aloe fibre for woollen, and cotton for silk carpets. A woollen carpet six feet by three feet costs Rs. 7, and a silk one of the same dimensions, which takes three times as long [viz., one month] to make, costs Rs. 44."

Mr. E. B. Havell says of the Ayyampet carpets, as he knew them in 1885–88:—"The patterns and colour of the carpets now made are not so good as those to be found in old carpets, but this is probably the effect rather than the cause of the decline in prosperity. These carpets do not appear to have found much favour in the European market. The pattern and colours, which are very bold and striking, do not suit the taste of the many, who in their painful anxiety to eschew anything vulgar, or in bad taste, fall back on so-called 'æsthetic' muddiness of colour and monotony of patterns."

"At the neighbouring inam village of Manojiappachavadi a few weavers make a coarser kind of woollen carpet"—'District Manual,' 1906. This industry appears to have absolutely died out.

BANGALORE.—The carpet industry in the Mysore State is said to have been started by Haidar Ali, with some weavers who were got from Golconda, Bijapur, and North India, about a hundred and fifty years ago. But in Buchanan's 'Journey through Mysore,' 1807, there is no mention of carpet-weaving, although he apparently deals exhaustively with the dyeing, weaving and sale of the textiles then made in the Province. The tables of exports show that, in fasli 1203, the value of carpets exported was only a little over five pagodas. There are in the city of Bangalore a few families that migrated there about twenty years ago from Ellore. All the families of the poorer weavers work at their trade; the few master-workmen, who are better off, employ only men and boys.

Aniline colours are exclusively used for low-grade carpets; in the better qualities both aniline and vegetable dyes are used. Indigo dyeing is done in the bazaar by professional dyers, and never by the carpet-makers themselves.

There is little demand in the Bangalore bazaar for pile carpets, most of those made being woollen daris on a mill-twist foundation, the designs of which are quite simple and rarely of any artistic merit.

The Bangalore Jail has had a reputation for many years for the production of carpets in good weave, soft attractive colouring, and in many excellent old patterns. It is most unfortunate, therefore, to note that a number of the colours now used are aniline, and it is to be hoped that the stigma which thus attaches to the carpet industry in the jail will soon be removed.

THE CENTRAL JAIL AT COIMBATORE weaves carpets of wool, cotton, aloe and other fibres. One peculiarity of the woollen carpets from there, which I have seen, is that the colours look more suited for cotton than for a woollen pile fabric.

ELLORE [GÓDÁVARI DISTRICT] lies low between the deltas of the Gódávari and Kistna. It has, as we have already seen, been the principal seat of the carpet industry in this Presidency for several centuries. The industry is carried on in the town itself, and in the adjacent suburbs of Sannivarapettah and Tangallamoodi.

Writing in 1852 of the exhibits sent to the great Exhibition of 1851, Dr. Forbes Royle says:—"The rugs from Ellore were universally admired for their general characteristics of beautiful Oriental pattern, fine weave, and rich artistic colouring; these seem well adapted to find ready sale in Europe." And Sir George Birdwood in 'The Industrial Arts of India,' 1880, tells us that:—"these, which are known in the London market by the name of *Coconada*, the place of their shipment on the Coromandel Coast to Madras, prove that carpets of uncontaminated native designs and integrity of quality are still made by the weavers of India, but of varieties not yet generally recognized by huckstering European dealers, and obtained from villages far away from English stations and railway lines. They are equal to anything ever produced in the Dekkan. The colours are now perhaps a little more brilliant than was observable in the memorable examples from the same district shown in the Exhibition of 1851, now in the India Museum; but this brilliance is really due rather to want of age, for the details have, in a high degree, all the varied play of colour and charm of pattern of the older carpets, and time only is required to mellow them to perfection. Two of these Coconada or Madras rugs have been sent to the South Kensington Museum by Mr. Vincent Robinson; one is of a very distinctive pattern, and perhaps the most beautiful known of this variety of Indian carpets. Their weavers are Muhamedan descendants of Persian settlers." [Both are entirely beautiful, and no such carpets are now made on the coast, probably not in India—H. T. H.]

There were a few Ellore carpets of very ordinary pattern and weave at the Madras Industrial and Arts Exhibition, 1903, and in my report upon that Exhibition I had occasion to say:—"The exhibits of carpets sent from Ellore were poor in conception, weave and colour; and a visit paid to that station by the writer a few months ago satisfied him that no single word of Sir George Birdwood's and Dr. Royle's lavish praise can now be applied to the industry. The patterns in use were poor, and often modifications of cheap Wilton, Kidderminster, and German power loom designs. Some of the old patterns are still with the weavers, but unfortunately there is no trade demand for this fine class of goods, the old dyes are being forgotten, and have given place to cheap anilines unskilfully applied." The panel on the title page of this book illustrates one of the oldest and best of the old Ellore borders, which doubtless came over, originally, with early settlers from Persia. It is a perfect setting for the "Aushan Khany" pattern.

Every Ellore carpet that I have seen since 1903 confirms the opinion I then formed, and, as I understand that several of the best of the old weaver-dyers are dead, it is much to be feared that many of the secrets of the Art have passed away with them. The dyeing profession has always been more or less conservative and hereditary, and has rarely been adoptive, unless the dyer, having no son, has occasionally adopted a nephew or the son of some relative or intimate friend. Almost everywhere in the East dyeing has been a trade brotherhood, in which the effort of each has been to show better results than his neighbour, and in which the bond and the creed have been reverence for the colour secrets. The old dyer's great fear has always been that his neighbour rival will, by trickery or craft, get at his secrets, and these have almost covered the whole field of vegetable life. He never was a chemist, as we moderns understand the chemistry of colour, his dyeing was all rule o'thumb

work, if you choose to call it so, but he got fast colour results, which were at once the joy and the envy of his employers and fellow workers. To-day this art has gone, never I fear to return, and in place of it we have the cheap, crude, harsh dyes from the German chemical factories with their garish tones.

Mr. E. B. Havell writing in 1885–88 says:—"the native demand is confined to small mats or rugs, but large carpets are made for European firms. The patterns are bold in character, of a floral type generally. The dyes in use are all native and prepared by the weavers themselves, and *I did not discover any in which aniline dyes were used*, but probably they may be found in some of the inferior small rugs, as is the case at Ayyampet, at Tanjore. The dyes most used are for crimson or red, stick lac and sappan wood [*Cæsalpina Sappan*]. Yellow, allikaya and turmeric. Orange or reddish yellow, the flowers of the moduga tree [*Butea frondosa*] combined with turmeric. Dark and pale blue, indigo. And other colours are produced by the combination of the above."

"The ordinary Ellore and Masulipatam carpets of small size prepared for the country bazaars are often of inferior stuff and badly made, but carpets of the superior class prepared only on special orders are equal in point of finish and material, and infinitely superior artistically, to the imitations of them made in the various jails of the Presidency. There may be a falling off in treatment of colour, and in the execution in the details in pattern compared with the finish in the working of Indian carpets made twenty or thirty years ago. The best patterns in use are not inferior to those of old South Indian carpets, which are held up to the disparagement of modern productions. Aniline dyes are very rarely used, as they are at Warangal and other places in Hyderabad. And I have seen carpets from the native looms at the three seats of the industry—Ellore, Masulipatam and Ayyampet—which are in no respect inferior to old specimens in the hands of connoisseurs in London, or in native houses and palaces."

It is quite clear, unfortunately, that Mr. Havell's words of commendation cannot now be applied to carpets woven in Ellore or the other two centres to which he refers.

The master weavers of Ellore have some old pattern pieces in distinctly uncommon old designs; it would be worth while getting them to copy the best of these in ten-stitch quality and in vegetable dyeing. Some of them are very old and faded, all are good.

Further information about the Ellore carpet industry will be found in the notes by Mr. Alfred Chatterton, B.Sc., and Messrs. Wilson & Co. of Madras.

In Madras City carpet weaving is of comparatively recent introduction, and the industry has never attained anything like large proportions.

The School of Arts has a few looms, and uses principally soft "mill-spun" wool from Cawnpore. The dyes used are vegetable, indigo dyeing being done in the bazaar. The school is, like the Jail Department, in possession of a copy of the magnificent 'Vienna Carpet Book,' illustrating in delicate colouring some of the best specimens of the old carpets of the East.

The Anjuman school workshop has a few looms. All dyeing is done on the premises by a Hindu, who has learnt most of his dyeing from the writer. Synthetic indigo is the only imported dye-drug that is used in the school. The Anjuman has a number of water colour and tempera drawings of good old Persian and North India designs.

Kaja Hussain Sahib, an ex-scholar and carpet maistri of the Anjuman, has a small factory. His trade is principally the manufacture of cheap low grade rugs dyed with anilines for export and local trade, but he is undoubtedly able to turn out a really good carpet in vegetable dyes if this be insisted on, and a decent price paid. There are one or two very small workers in the bazaar, whose make calls for no comment.

Masulipatam in the Kistna District has probably been connected with the carpet-weaving industry as long as Ellore.

There is no doubt that the Hon'ble East India Company was shipping carpets from this place at the end of the XVII Century. The industry appears to have been in a state of decay for many years, and, with few exceptions, carpets from thence are of very inferior weave and colour. Even the blues were aniline in a number which I had an opportunity of seeing a short time ago.

Sir George Birdwood, in his 'Industrial Arts of India' says:—"The carpets of Masulipatam were formerly amongst the finest produced in India," and, complaining bitterly of the deteriorating influence of English indentors upon the industry, he concludes his note by saying "these glorious carpets of Masulipatam have sunk to a mockery and travestie of their former selves."

I have been able to secure very little information from Masulipatam regarding the present condition of the industry there, but it may be assumed generally that its circumstances are much the same as those of the trade in Ellore.

THE RAJAHMUNDRY JAIL makes a few woollen, cotton and other fibre carpets. Some of the colours in use are excellent; others, unfortunately, appear to be anilines.

RANJANGUDI IN THE TRICHINOPOLY DISTRICT had a reputation for cotton pile carpets. The colouring and design have been described as very excellent. The industry appears, however, to have died out altogether.

THE TANJORE JAIL has a small selection of good carpet patterns. I have never had an opportunity of seeing any of the work turned out there.

THE VELLORE CENTRAL JAIL [NORTH ARCOT DISTRICT] has an old established and well deserved reputation for fine woollen pile carpets. There is in the jail an excellent selection of old pattern pieces, a collection of which might—together with some from Ellore, and, possibly, Masulipatam—well be copied and exhibited in the Madras Museum, which has at present only six small squares illustrating Ellore designs, and a coarse Ayyampet silk rug. A few years ago the mistake was made of introducing aniline colours into the carpet work of this jail. The error was soon discovered, and promptly stopped. The reader is referred for further information regarding the work in this jail to the very interesting note which has been submitted by the Superintendent, Mr. G. Cloney.

WALAJANAGAR [NORTH ARCOT DISTRICT] is an old seat of the carpet industry. The few weavers remaining there say that they were brought from Bunder (Masulipatam) by the Nawábs of the Carnatic about 150 years ago. A few looms are employed in weaving rugs, which are miserably poor in pattern and colour, a little better perhaps than the commonest of the Bangalore and Ellore weaves. On my visit there last year I was told that several silk carpets in twelve and ten stitch qualities were being woven, and that the dyeing was all aniline except the blues and yellows. I was unable, however, to get to see them. The few weavers I saw told me that the trade was dead, and that all who could were giving it up, and taking to other means of livelihood.

MALABAR DISTRICT.—There are now no carpets of any kind made in this District, and it is a strange fact that all traces of the old Malabar carpets [sometimes called "Coast" or "Zamorin" carpets], of the XV, XVI and early XVII Century, have been lost. The enquiries made by the Collector of Malabar, the Resident in Travancore and Cochin, and others, prove that there are apparently none now in existence anywhere on the West Coast.

Baldæus, "Minister of God's word in Ceylon," in his interesting 'Description of Ye East-India coastes of Malabar and Coromandel,' *Amsterdam*, 1672, writes thus regarding Vasco de Gama's visit to the "Sammoryn of Calecutt," 1607, at Parrane [? Ponnani]. "The floor and walls of the hall were spread with Carpetts of tapestry and silk and gold," and, "The Sammoryn was seated upon an *Alkatif* or Carpett."

John Huygen Van Linschoten, in his —'Voyage to the East Indies,' 1583–89, Trans. *London*, 1598, [Hakluyt Socy.], says of the weddings of all well to do people in Goa,—"the neighbours and nearest friends lie on rich Indian carpets in the windowes, and throw Rose Water upon the Bryde and Bridegroome."—This and the foregoing quotation go, I think, to show that Indian carpets were in fairly common use on the West Coast. But there is no evidence whatever, in any of the authorities I have consulted, to prove that carpets were ever made on or near the Malabar Coast.

It seems likely that the "Zamorin" carpets were woven in the Deccan, the Balaghat, in Central India, or at Ayyampett, Ellore or Masulipatam, and probably to the special instructions of those for whom they were manufactured. And it is on record that carpets and rugs [*alkatif*] were often brought to Calicut and Goa, by traders from the Persian Gulf and Red Sea. There is no doubt that the 'Zamorin' carpets were in altogether special designs, quite different from any other makes now known in India, except perhaps some of the Multan and Tanjore-Ayyampett bird and animal patterns, and it is, I think, a reasonable assumption that these special 'coast pattern' carpets, were made for people on the Malabar Coast at some fairly distant carpet weaving centre.

These were the only woollen pile carpets made from pure Hindu designs, and free from European or Saracenic influences. Sir George Birdwood, writing so recently as 1879, says of this class of carpet:—"No other manufacturers of carpets known could hold a pattern together with such a scheme of colouring and scale of design. The simplicity and felicity shown in putting the right amount of colour and exact force of pattern, suited to the position given them, are wonderful and quite unapproachable in any European carpets of any time or country. They satisfy the feeling for breadth and space in furnishing, as if made for the palaces of kings. They are made from a coarse kind of wool peculiar probably to the locality, and are distinguished by their large grandly coloured patterns. The texture of the wool is exactly suited to the designs used, which are gay in tone, colossal in proportion, and wonderfully balanced in harmonious arrangement." The patterning was bold, and arranged in large medallions filled with geometro-floral and animal forms.

The late Mr. J. H. Prince, of Travancore, told me a few months ago that he had seen one or two of these interesting old Malabar carpets, which he described most clearly, and promised to get photographs and descriptions of them. His lamented death, soon after, prevented the securing of any further information. One or two Malayáli gentlemen whom I met at the Industrial and Arts Exhibition, 1903, said they had seen some small rugs, several of which were in rags, and that they were very rare. The only existing specimens appear to be the one or two rugs in the South Kensington Museum, and the one which was in the possession of Mr. Vincent Robinson. (*See* Appendix.)

Cotton pile carpets appear to be now rarely made in South India. They soon look shabby and dirty, and there is very little demand for them. The few that are produced are most often made in the simpler woollen carpet patterns, frequently in shades of blue and white, much after the style of the Multán cotton carpets.

It is strange how little is known of the carpet industry outside the Districts where it is carried on, and the ignorance of some who claim authority to write on the subject is most colossal. W. D. Ellwanger, in his book 'The Oriental Rug,' is good enough to tell us that "India provides us only with some fine large carpets mostly of modern make, and also with many imitations of Persian rugs, made in part by machinery, like the current substitute for a Turkish towel"! and with this five-line paragraph he dismisses the Indian carpet industry altogether, except for a casual allusion or two to India, and to Kashmir carpets.

We have seen that, outside Government and aided institutions, the Carpet Industry in South India has in recent years become debased and degraded, and that, wherever the

weaver is left uncontrolled, he uses the commonest and most unsatisfactory of dyes, the worst of wools, and is weaving poor, cheap, tawdry carpets. It is difficult to blame him; he has been forced by circumstances to make just what trade wants and will buy. So he cannot, as did his forbears, put his heart into the dyeing and the weaving of the fabric he makes, knowing, as they did, that it would be the admiration of all, and that they could command a good market for it.

In South India the weaver has to contend with a trouble that does not affect his compeers in the North. They have little difficulty in securing several grades of wool, each of which is fairly well suited for the class of carpet usually made in the locality, but I have frequently been told by small master-weavers from Ellore, Masulipatam and Walajanagar that they have often started a good class order-carpet in live wool, and have been compelled, by absolute inability to procure more, to finish it with chunam wool. Ordinary dyeing will never suffice to give "chunam wool" the colours which live wool takes. So they have had to resort to "topping" or overdyeing with anilines, to get something like a match. This of course means that after a year or two the main body of the carpet will have just commenced to "mellow," while the small part worked in dead wool, and overdyed with anilines, will have seriously faded. I have seen several carpets in South India which prove this statement to the hilt, and, I have never, in my eleven years' experience of the industry in Northern India, seen a similar case there, although I have in that time come across many carpets in which some colours were good vegetable ones, and others of cheap German origin.

The suggestion which I have made in the Section on Wools, for the importation of a few high-class rams annually, appears to me the only possible solution of the wool difficulty, for so many of the breeds of sheep reared in the Presidency carry bristly hairy fleeces, which are unfit for anything except the making of the coarsest and the roughest of cumblies.

It is impossible, now that English and German chemical colours have obtained such a hold on the country, that Government can follow the examples of the Shâh of Persia and the Maharaja of Kashmir, and absolutely prohibit, under serious penalties, the importation of these colours into the country. And it seems most unfortunate that this danger to the industry of the country was not foreseen and provided for twenty-five years ago. It would then have been possible also to cultivate systematically upon a commercial basis, many of the cheap vegetable dye-stuffs, all of which are now so little known, and many of which have been forgotten altogether.

Up to the early part of the last century the Indian dyer (who originally came from the old Persian stock) probably had as great a range of dye-stuffs as has the Persian *boyaji*. The extract to be found elsewhere from J. K. Mumford's 'Oriental Rugs'—Dyes and Dyeing—shows how great the selection is. All nature appears to have been laid under contribution to secure the beautiful colour shades of the Persian dyer.

The one remedy for the existing state of things in the dye-shed appears to me to be the establishment at Ellore, or at the Madras School of Arts, of a fully-equipped dyeing class, under a master dyer imported from North India, where trained young weavers, who are able to read and write fairly well, can be admitted as Government scholarship holders, and be put through a thorough course of dyeing. They should be practised in the old vegetable colourings, and also, possibly, put through a course of proper wool-dyeing in the better classes of chrome and alizarine colours. It is unfortunate that the need for teaching this exists at all, but this class of colour has come to stay, and it seems advisable, therefore, that efforts should be made to teach thoroughly and scientifically its proper application. Mr. Baden H. Powell, B.C.S., in his valuable 'Handbook on the Economic Products of

the Punjab,' 1868, remarks:—"No art suggests so much the want of Vernacular Instructors or Trade Manuals as that of dyeing."

The carpet-weaver class appear to me to deserve all possible assistance and support at the hands, not only of the Public and the Trade, but also of Government. And, as the following remarks in Mr. Thurston's 'Woollen Fabric Industry of the Madras Presidency' agree so entirely with my own views upon the subject, I venture to reproduce them without further comment:—

"Though it would be ambitious to hope that a monograph such as the present one, written, *faute de mieux*, like its predecessor on the Madras cotton fabric industry, by one who is primarily a naturalist, could have any practical result, I have published the recorded opinions of those possessed of the necessary experience to speak with the voice of authority. And, as a sympathiser with the hereditary weavers, who in time of famine, such as we have lately passed through, have to seek the protection of the Government, I would put forth a plea on their behalf as against the long-sentence convict, who is not born a weaver, but becomes one as the result of crime. Far be it from me to wish that convicts should be treated in the manner depicted in 'Never too late to mend.' But I do wish that the convicts, while kept usefully employed, should be employed only at such occupations as are above all suspicion of coming in conflict with the interests of honest folk, whose traditional caste occupation should be protected."

Few of the ruling chiefs in South India do anything for the support of an industry, which, in its best days, was almost entirely carried on in the interests of Sovereigns, Princes, nobles, and the rich. There is little doubt that Akbar, "the Great," brought the art into North India from Persia, and established in Lahore a factory for the making of carpets for himself and his great oomras and feudatories. And, although carpet-weaving evidently came to South India with poor immigrants from Persia, it is reasonable to suppose that for a long time, at any rate, Princes and nobles were the best patrons of the weavers of the south.

To-day almost every Chief and Zamindar prefers to see on his floors the cheap gaudy products of second-rate English and continental power-looms, and he probably pays quite as much for these as he would have to give for a fine copy of an old design made in South India, and which would be—if properly looked after—as much an object of beauty to his great-grand-children as to himself.

In this respect the young Maharaja of Mysore has set a splendid example. In the new palace at Mysore all the carpets and rugs are Indian, some of the largest having been made in North India, and others in the Bangalore Central Jail. It is perhaps unfortunate that no orders were placed with weavers in the other centres of the industry in Southern India, but the difficulty of keeping in touch with, and supervising the work of small master-weavers so far afield, was, probably, inevitable. [Since the foregoing was written we have been told in the newspapers that the carpet for the great durbar hall in the Mysore palace has been ordered from Europe through a Calcutta firm.]

There is at present absolutely no real teaching of wool-dyeing within the Presidency. In the Madras School of Arts the dyer-maistri does not—if weavers who have earned Government Technical certificates are to be believed—give any instruction to the scholars, and this probably because most of the scholars "join the class merely for the sake of the scholarships, which enable them to continue their studies in the drawing classes." And there appears no reason why they should trouble to learn dyeing, their object being to go "out as drawing teachers or draftsmen."

In the Anjuman schools very little teaching of dyeing has been done. The funds of the institution have never admitted of money being spent to any extent in the teaching of

dyeing, and the consequent use of dye drugs and wool, although boys have been put to work with the dyer, and so acquired some little knowledge of the art.

The Chengalroya Naicker Technical School, Madras, appears to get its dyeing done outside, because the Anjuman was indented on for the dyed yarns for the last Government Technical Examinations, 1906.

CARPET WEAVING AT ELLORE.

By Mr. ALFRED CHATTERTON, B.Sc.

Between the deltas of the Gódávari and Kistna rivers lies a huge shallow depression known as the Kolair lake. On the northern margin of this swamp, and not far from the ruins of Pedda Vengai, the once splendid capital of the Andhra dynasty, is situated the town of Ellore, where for centuries past the descendants of Persian settlers have pursued their hereditary occupation as carpet weavers. From a commercial standpoint, the industry was probably never a big one, but, judging from the number of looms that now stand empty, it formerly gave employment to twice as many people as it does at the present day. Elsewhere in the Madras Presidency, except in the jails, the industry has entirely died out, and here it would also have suffered the same fate, but for the enterprise of Messrs. Arbuthnot & Co. and Messrs. Wilson & Co., who for years past have financed the weavers and shipped their products to England. Now, one of these firms has disappeared, and, unless another takes up the same line of business, it is greatly to be feared that the manufacture of the better-class carpets will altogether die out at Ellore.

It is difficult to trace with certainty the causes which have almost entirely extinguished private enterprise in carpet-weaving in the south of India. The jails have a good deal to do with it, the change in the tastes of the wealthier classes has probably more, and finally it is not unlikely that the rapid growth of the population both in numbers and in material prosperity has led to a greatly increased demand for kamblies spun and woven from indigenous wool. Things are at their worst at Ellore just now, as the cyclone of 1905 killed off an enormous number of sheep in the Northern Circars, with the result that the price of wool has risen, and is now fully 2 annas a pound more than it was two or three years ago.

The wool used at Ellore is of local origin, and is obtained from the Kurubas or shepherds, whose flocks of sheep graze in the upland taluks of both the Gódávari and Kistna Districts. The sheep are washed and shorn by the shepherds, and by them the wool is teased and spun into thread. Apparently no spinning wheel is used, but, by a deft movement of the hand across the thigh, the fibres receive the necessary twist to form the yarn. As may be imagined, the spinning is crude, rough and irregular, and the yarn possesses very little tensile strength. Nevertheless, when suitably dyed, it is capable of being worked up into fabrics of great beauty and extreme durability. The wool as it comes from the sheep is black, brown or white, the latter colour naturally fetching a considerably higher price, as it alone can be used for the lighter and more delicate shades of colour. The weavers buy the yarn wound in small cops, and they do all the dyeing themselves. For the better class of carpets vegetable dyes are still used, but for the cheap carpet and rug trade, which is the speciality of Messrs. Wilson & Co., aniline dyes are invariably used. Nothing need be said about the methods of dyeing employed, as with but slight modifications they are in use wherever vegetable dyed carpets are made in the Presidency. Most of the jail maistries, and the instructors in the Government School of Arts in Madras and in the

Anjuman Workshops, follow Ellore methods of dyeing, though it is probable that modifications are slowly being introduced. Undoubtedly this is the case with indigo, as it is much less trouble to use the artificial product of the German dye works. Nevertheless, natural indigo is still used in Ellore, and there is no doubt that the permanence of colour thereby secured is worth the extra trouble and expense.

Carpets are made in Ellore, and in the suburbs of Tangallamudi and Sannivarapettah. There are said to be about 100 karkanas or carpet factories, with an average of about two looms in each. Many of the karkanas contained only one loom, and that often a small one suitable only for making rugs; but, on the other hand, some contained seven or eight looms varying in length from 12 to 18 feet, the largest loom in the town having a span of 24 feet. For warps cotton seems to be almost invariably used, and apparently Messrs. Binny & Co. have a monopoly of the supply. The threads of the weft or woof are usually of jute, but sometimes twine or hemp is employed. The price of carpets varies with the number of stitches to the foot, Rs. 10 a square yard being charged for carpets with 100 threads to the foot, Rs. 8 for those with 90, and Rs. 4 when the number does not exceed 55. The weavers are invariably paid on the piece-work system, the unit of work being a length of $1\frac{1}{2}$ feet, for which 2 annas is paid for every 50 *varisas* or lines of stitches in the case of coarse common carpets, and 2 annas for every 30 *varisas* in the case of the much finer carpets. Practically this amounts to the weaver tying 2,250 knots per anna. At this rate a man can earn about 3 annas a day at the utmost. And as the weavers do not combine their trade with agriculture, they are always in a state of poverty, and, when trade is slack, are often reduced to destitution. All the weavers are Muhammadans, and, as the women are gosha, only the men are wage-earners. The industry is mainly in the hands of two or three maistries, who receive advances, and distribute the orders to their piece-workers. Occasionally carpets are made for Zamindars and wealthy natives, more frequently for European officers, but in the main the trade is now in the hands of the two firms already mentioned. The old patterns are still well known, and, if the men are left to themselves and not too much restricted in the matter of price, they are capable of producing carpets and rugs of as good quality as ever they did.

For the export trade, especially in the cheaper lines, patterns are usually supplied. The designs are generally simple, and, as the dyes are invariably anilines, the colours are crude and glaring. It is to be regretted that hand labour should be degraded to producing such inferior work. The patterns of the old carpets consist of the border or *anchu* and the *khana* or central ground, and a large number of varieties of carpet are obtained by the various combinations of *anchu* and *khana*, and by changes in the colours of both. Both *anchus* and *khanas* have received distinctive names. Among the former may be mentioned the Jampal or guava, the Chola Ghana or small marigold, the Bada Ghana or large marigold, the Kuthavan or God, and the Thumba anchu. Several well-known patterns have received the names of the persons associated in some way or other with their origin. Such is the Ankinedu, which is the family name of the Sallapilly Zamindar, the Rohde **anchu* named after some European who furnished the design, and the Latchma Rau anchu. Names of the more important khanas are Gopal Rao, Ramachundra, Hashim, Pharsi, Shâhnamaz, Gulbunthi, Ambarcha Ananas, Shâhnamal, and Babul.

There is little vitality, and absolutely no originality whatever among the carpet-weavers at Ellore at the present time. The work is purely mechanical and entirely confined to the re-production of their old patterns, or the copying of such as are furnished to them. The

* This is evidently John Rohde, M.C.S., who retired from the service about 1865, as Inspector-General of Jails, one of the finest carpenters and mechanics, if not the finest who ever was in this Presidency. Wherever he went, he built houses. I have been in houses built by John Rohde 25 years before I was in them, and *still* every door and window fitted perfectly.—W.F.G.

industry is in a very decadent condition, but will continue to exist so long as orders can be obtained at prices which will furnish the most meagre livelihood. It is difficult to say whether anything can be done to resuscitate the industry, but it is easy enough to indicate the directions in which work will have to be done.

The supply of wool is precarious, and of an inferior quality. It seems doubtful if there is enough to justify the establishment of a modern spinning plant, but probably, if such were established, a considerable quantity of wool now consumed in the manufacture of kamblies would become available. The native processes of dyeing with vegetable colours produce satisfactory results, but they are crude, inefficient and expensive. Possibly much could be done to improve them, and, in some cases, alizarine dyes might be introduced with advantage. The weavers themselves want training, and their artistic perceptions, if they have any, awakening, and finally the industry, if it is to pay and flourish, must be confined to the manufacture of the highest class of carpet.

There is a steady demand for Indian carpets, and the jails usually have more orders than they can supply, but the total production of carpets in India is very small, and it is doubtful if they have ever been properly exploited in the markets of the rest of the world. At present each jail disposes of its own manufactures, and a certain number of carpets are sold to people in India. Much has been written and said about the blighting influence of jail competition, and there is no doubt that it has to some extent prevented the development of the Indian carpet trade. It is further doubtful if the jail-made carpets are disposed of to the best advantage. Throughout India the total production of jail-made carpets probably amounts to several lakhs of rupees, and, if these were sent home to a Central Government Depot, and an efficient agency established to dispose of them, much higher prices would probably be obtained. And, if the local sale of carpets in India were entirely prohibited, private enterprise would probably become more vigorous. In Europe and in America Indian carpets are not properly advertised, and there is but little doubt that, if this were done, ten times the present production could easily be disposed of. The question is whether it is worth while, whether the available supply of wool cannot be better utilised in providing clothing for the people, and whether it is desirable to encourage and resuscitate on a large scale an industry, which, even under the most favourable circumstances, can only afford a miserable livelihood to the majority of the workers.

MESSRS. WILSON & Co. OF MADRAS HAVE BEEN GOOD ENOUGH TO COLLECT THE INFORMATION EMBODIED IN THE FOLLOWING NOTE.

There are about 3,000 weavers in Ellore and District, and there are about 400 looms, which vary in size from 3 to 30 feet. Some of the weavers combine their trade with agriculture, but most depend upon weaving for their livelihood. In some cases the families of the weavers work at cleaning and spinning wool, and weaving, dyeing, etc. Where the family does not perform the work, either coolies are hired, or the cleaned and spun wool is bought outside ready for weaving. Weavers in Ellore are usually paid by the day, at the rate of 4 annas. The wool used in Ellore comes wholly from the Gódávari and Kistna Districts. The Ellore make of carpets is approximately about 555 bales or 55 to 60,000 square yards per annum. The usual quality is $4\frac{1}{2}$, 5 and $5\frac{1}{2}$ stitches per inch.

The wool used in the District is mostly dead or "*Chunam*" wool. This is the wool cut from slaughtered or dead sheep after death. It is called "*limed*" or "*chunam*" wool because it has to be treated with lime and other strong alkalies before it is taken into use. We

know of no means of removing the objectionable odour from limed wool except by washing several times in water.

For the most part cotton thread is used for the warp, which thread is supplied principally by Messrs. Binny & Co. For jute-backed carpets the twine comes from Calcutta. Jute, however, has practically ceased to be used now.

Practically the whole of the output of the Ellore looms goes to the London market.

The finest stitch grade carpet or rug that is made is 90 threads per foot, and the coarsest is 36 threads per foot.

We have no knowledge of the processes used in dyeing at Ellore. Should wool be dyed to an excessive colour, it is used as it is. We do not think dyers make any effort to get rid of the excess, but have no definite knowledge on the point. Topping, second or over-dyeing with anilines is practised to give brightness to soft dull colours.

There is a ready sale for all sizes of mats, rugs and carpets from 2 feet 10 inches by 1 foot 4 inches up to 30 by 20 feet. "*Farsikhani*" is the most popular design, and the most expensive to make, "*Hashamkhani*" or "*Aushankhani*" is also a popular design.

Large numbers of carpets and rugs [especially the latter] continue to be made for shipment through Madras firms to the Auction Sale Warehouses in Cutler Street, London, but the "order" trade has largely increased during recent years. "Consignment" goods are only advanced against when received and examined by Madras agents. The advance depends upon colours, quality, etc.

The designs in greatest demand are "*Farsikhani*" and "*Aushankhani.*" The former, however, has an almost prohibitive handicap in its very high first cost. Most of the designs made are old Oriental ones, though some are copied from modern ideas. The price of wool has been going up steadily during the past few years; about 1902 the price was approximately twenty-five pounds per rupee, now it is twelve to fifteen pounds per rupee.

NOTE BY MR. G. CLONEY, SUPERINTENDENT, CENTRAL JAIL, VELLORE, UPON THE CARPET INDUSTRY AS CARRIED ON IN THAT JAIL.

About 100 convicts are employed at carpet-making in the jail. The smallest loom is 3 feet wide, and from thence the sizes range onwards; the largest is 30 feet wide. There are 46 looms and 370 feet of loom space. The convicts employed were agriculturists in their homes. The jail obtains supplies of raw wool locally, from Bangalore and from Bellary. The convicts clean, wash and spin it themselves. The female prisoners do a considerable portion of the spinning. Wool ready spun is not available in the local market. The wool has first to be bowed or teased; this is done here by machinery after the impurities or adulterations have been removed. The teased wool is rolled up into wicks, and spun by hand. The spinning wheel used is the time-honoured wheel of India, known and recognized in each and every village throughout the country.

Carpets are made of 36 threads to the inch, and range up to 144 threads according to quality. The quantities of carpets made in a year are about 1,655 square yards.

Wools in use are as under—

(i) Superior wool.
(ii) Superior second-sort wool.
(iii) Chunam or dead wool of all natural shades.

Cotton yarn Nos. 4's and 10's are used for warps, and also English twine, jute and hemp, whenever so ordered. Cottons are obtained from private trading mill owners throughout the

Presidency. European twine is obtained from Madras. Convicts weave the carpets. There is a free maistry who looks after the work, and his pay is Rs. 30 a month. A trained convict weaver does 144 to 180 square inches per diem in the lower grade carpets.

Three classes of carpets and rugs are usually made, namely :—

I.	At	rupees	10	to rupees	16	per square	yard
II.	At	„	6	to „	9	„ „	„
III.	At	„	3-14	to „	5	„ „	„

according to quality.

The aniline dyed carpets are the cheapest kind. Carpets are made as ordered by Messrs. Wilson & Co. and Mr. R. Simpson, Madras, who export to England. Orders from private individuals also form a considerable output throughout the year. The finest stitch grade carpet or rug that is made is 256 stitches to the square inch; the commonest grade carpet or rug made is 36 stitches to the square inch. Vegetable dyes are the most permanent, and consequently the best. Coal tar and aniline dyes are fugitive, and are therefore not generally used, but the latter are used only for carpets for trade purposes, and when so ordered. Those requiring good carpets never order either coal tar or aniline dyed ones. Cultivated indigo is the only matter used by us. I am unable to compare this with synthetic indigo, etc., which have never been tried.

Indigo is ground with sulphuric acid, and has to be kept over for 24 hours before it can be used. The mixture is then treated with boiling water, and diluted according to the shade required. The sulphuric acid solution (sulphate of indigo) is the process adopted here. My experience goes to show that this method gives more satisfactory results in dissolving and drawing out all colouring matter.

The drugs required for dyeing 10 lb. of wool are as follows :—

DEEP GREEN.

10 lb. Blue wool.
4 lb. Murukkambu (flowers of *Butea frondosa*).
1½ lb. Turmeric powder.

TERRA COTTA.

3¼ lb. Lac dye.
2½ lb. Turmeric powder.
1½ lb. Alum powder.
8 lb. Tamarind.
5 lb. Fuller's earth.

ORANGE.

1½ lb. Turmeric powder.
12 oz. Alum.
4 lb. Murukkambu.
4 oz. Chunam.
6 lb. Murukkambu.

SCARLET.

1 lb. Lac dye.
2 lb. Tezab or acid.
2 lb. Pomegranate bark.
½ lb. Turmeric powder.

COPPER RED.

4 oz. Gallnut powder.
4 oz. Turmeric powder.
24 botts. Logwood infusion.
oz. Catechu.

DULL OLD GOLD.

10 lb. Red wool.
1½ lb. Turmeric powder.
12 oz. Alum.
5 lb. Murukkambu.
5 lb. Fuller's earth.
1 oz. Iron sulphate (Heerakasees).

DEEP YELLOW.

1½ lb. Turmeric powder.
12 oz. Alum.
4 lb. Murukkambu.
1 oz. Iron sulphate.

LEMON YELLOW.

1½ lb. Turmeric powder.
8 oz. Alum.
6 lb. Murukkambu.
4 oz. Gallnut powder.

DEEP BLUE.

6 oz. Indigo.
1 lb. Sulphuric acid.
8 oz. Alum.
15 lb. Chunam.
3 oz. Iron sulphate.

PURPLE.

1 lb. Lac dye.
4 oz. Sulphuric acid.
1 lb. Pomegranate.
1 lb. Turmeric powder.

LIGHT GREEN.

10 lb. Blue wool.
1½ lb. Turmeric powder.
1 oz. Gallnut powder.
4 lb. Murukkambu.

OLIVE GREEN.

10 lb. Blue wool.
144 botts. Murukkambu water.
4 oz. Turmeric powder.
½ oz. Iron sulphate.

BRIGHT YELLOW.

1½ lb. Turmeric powder.
1 lb. Alum.
8 lb. Murukkambu.

PALE BLUE

6 oz. Indigo.
1 lb. Sulphuric acid.
28 oz. Alum.
20 lb. Chunam.

SAPPHIRE BLUE.

6 oz. Indigo.
1 lb. Sulphuric acid.
8 oz. Alum.
10 lb. Chunam.

SAP GREEN.

10 lb. Blue wool.
1½ lb. Turmeric powder.
4 lb. Murukkambu.

PEA GREEN.

10 lb. Blue wool.
1½ lb. Turmeric powder.
1 oz. Gallnut powder.
4 lb. Murukkambu.

BRONZE GREEN.

10 lb. Blue wool.
1½ lb. Turmeric powder.
4 lb. Murukkambu.
8 oz. Gallnut powder.
4 oz. Catechu.

GRAPE GREEN.

10 lb. Blue wool.
1½ lb. Turmeric powder.
4 lb. Murukkambu.
2 oz. Gallnut powder.

NUTTY BROWN.

3 oz. Gallnut powder.
3 oz. Turmeric powder.
8 botts. Logwood water.
6 oz. Catechu.

KHAKI.

4 lb. Gallnut powder.
2½ seers Chunam.
5 lb. Fuller's earth.
1 lb. Catechu.
8 oz. Turmeric powder.
8 oz. Yellow ochre.
1 lb. Pomegranate.

CAMEL COLOUR.

2 oz. Iron sulphate.

DEEP ROSE COLOUR.

2¼ lb. Lac dye.
1½ lb. Alum.
8 lb. Tamarind.
5 lb. Chunam.

FLESH PINK.

2½ lb. Lac dye.
1¾ lb. Alum.
8 lb. Tamarind.
5 lb. Chunam.

DARK BROWN.

4 oz. Gallnut powder.
4 oz. Turmeric powder.
24 botts. Logwood water.
8 oz. Catechu.

LIGHT BROWN.

2 oz. Gallnut powder.
2 oz. Turmeric powder.
6 botts. Logwood water.
4 oz. Catechu.

BUFF.

3 oz. Iron sulphate.

CREAM.

5 lb. Fuller's earth.
8 oz. Bar soap.

PALE ROSE COLOUR.

1¾ lb. Lac dye.
1 lb. Alum.
7 lb. Tamarind.
5 lb. Chunam.

Dyed yarn is washed in vats to get off surplus colouring matter. Topping, or second dyeing, is done to produce brightness of shades. There is always a demand for carpets. The most popular sizes are 15 by 12 feet to 6 by 6 feet. Purely Indian designs are most appreciated. Carpets and rugs are now ordered by Messrs. Wilson & Co., Madras, and Mr. R. Simpson, Madras, for export. All designs as made here, both for trade and private, are solely Indian. We manufacture only to order, and payment is made at time of delivery. We use only country wool; mill spun or any other kinds of wool imported or mill treated, are not used.

—	1903.	1904.	1905.	1906.
	Rs. A. P.	Rs. A. P.	Rs. A. P.	Rs. A. P.
Chunam white wool *per 25 lb.*	2 8 0	2 2 6	2 8 0	2 14 6
Superior white wool	5 12 0	6 6 0	6 6 0	6 4 0
Superior black wool	.....	5 0 0	5 4 0	5 4 0
Red (rufous and brown) wool	1 2 0	1 8 0	2 0 0	2 4 0

The objectionable odour from chunam or dead wool is caused by the tanning process, and the adhesion of particles of animal matter. The odour can be removed by 24 hours soaking in quick (stone) lime, and afterwards thoroughly washing out with Fuller's earth. After this is done, the wool should be washed thrice in clean water.

NOTE ON THE INDUSTRY IN THE BANGALORE CENTRAL JAIL, BASED ON INFORMATION GIVEN BY Dr. P. S. ACHYUTA RAO, OF THE MYSORE MEDICAL STAFF.

The number of carpet weavers varies with the work in hand. Just now, owing to all the looms being in work, the number of convicts employed is 62. There are nine looms, varying in length from 21 to 29½ feet, the total carpet loom space being 191 feet. The men employed are not by profession carpet makers. Such of the long term male convicts as show an aptitude for the work, and are possessed of the requisite amount of intelligence, are trained here. By profession they are mostly agriculturists or traders.

The required quantity of raw wool is supplied by a contractor. The wool is altogether cleansed, washed, bowed and spun by convict labour. Carpets are made only to order, and by ones and twos; and contain from 4 to 16 stitches to the inch, according to the nature and quality of the carpet. Wools in use in this jail are clipped white, clipped black, clipped fawn, and clipped grey. So far as experience has taught, it is found impossible to remove the fetid odour of limed wool which gets moistened. So long as the wool is dry the odour is masked, but on drying there is a return of the fetor which is not wholly avoidable. Only cotton thread is used in warping and woofing. The thread is obtained from the contractor. The carpet maistry is paid Rs. 15 per mensem, and he is not a convict. The quantity woven averages 4 inches a day of the carpets having 8 stitches to the inch, 2 inches a day of those having 12 stitches to the inch, 1½ inches a day of those having 16 stitches to the inch. The finest quality carpet made is the "Polly pattern", in quality 16 stitches to the inch; the coarsest quality is the "Persian flower pattern" 4 stitches to the inch.

The dyes used in this jail are German-made aniline dyes ["Aniline and soda fabrik"]. Only Madras-made indigo is used here—it answers the purpose fairly well. The principal substances used for dissolving indigo are fuller's earth, chunam and indigo seeds.

The dyeing process for indigo is as follows:—

(1) Fuller's earth and chunam are first powdered and mixed together, and put into a big earthen pot or *gudava* having a small hole at the bottom, and filled with water and placed on the top of another *gudava.*

(2) Indigo seeds are well boiled, and then pounded with the indigo, and left to soak in water for about a week.

(3) The water which passes through the small hole in the upper of the two *gudavas* is well mixed with the boiled indigo, and a solution is made.

(4) The wool, after being well washed in chunam water, is soaked in the said solution, well stirred, and left for a day. The wool is then taken out and dried in the sun.

Scarlet or red.—Take 10 lb. of white wool, which has been well cleaned by boiling in water, with which 2 lb. of fuller's earth have been mixed. Take 3 lb. of lac, and put it to soak for half a day in a pot half full of water and having a cover. The lac is then taken out and ground into a fine powder; one potful of water is poured on to it, and left to stand in the same pot. Next pour three small potfuls of water into another big pot, and, mixing 8 lb. of tamarind with it, allow it to stand for a whole night. Next morning place a big dyeing pot on a fire place prepared for the purpose. The fluid substance of 3 lb. of lac should be poured into the pot, and to this should be added 2 lb. of powdered alum and two small pots of tamarind water. When well mixed, these ingredients should be well boiled, and the 10 lb. of cleaned wool placed in the pot. The remaining tamarind water should be added, one small potful at a time once every hour. The wool so boiled will take on the required red colour. Lastly dip the wool in 1½ potfuls of water, to which the juice of 25 limes has been added. The wool is then put out to dry.

Orange.—Take 10 lb. of uncleaned white wool, and soak it for half a day in cold water, with which 2½ lb. of yellow powder [aniline fabrik] have been well mixed. Put 2½ small potfuls of water in a large pot, and mix 2½ lb. of the yellow flowers of *muthakada huvvu* [*Butea frondosa*] from which all stalks, etc., have been completely removed. Add 10 lb. of powdered alum and 1¼ lb. of powdered turmeric. Watch the wool till it boils, and have ready 18 pots of water mixed with 3 lb. of fuller's earth and one small pot of thick chunam water, and, when it turns to the required orange shade, take it out and dry in the shade.

Bright or light yellow.—Take 10 lb. of uncleaned white wool, and soak it for half a day in cold water with which 2½ lb. of yellow powder have been well mixed. Put 2½ small potfuls of water in a large pot, and mix 2½ lb. of *muthakada* flowers free of all stalks, etc. Add 10 lb. of powdered alum, 1¼ lb. of powdered turmeric, boil well and put in the wool. When it turns of the required shade of yellow, take it out and dry in the shade.

Pale or light blue.—Take 10 lb. of white wool, wash it in water containing 5 lb. of chunam, and leave it to soak in the same water for a night. In the morning the wool should again be well washed. Mix half a pound of the best quality of indigo, and put six small pots of water to boil. When well boiling, put in the wool and ½ lb. of the indigo solution. Stir and shake the wool well until it is of the shade required, when it should be removed, washed in cold water, then in alum water, and dried in the sun.

Deep or dark blue.—The same process as for light blue, except that 1 lb. of indigo solution is used instead of ½ lb.

Light green.—First dye the wool dark blue by the process detailed above. Put 3 lb. of *muthakada* flowers into three pots of water. Stir well together, and, when the water turns red, remove the yellow flowers and put in 1½ lb. of powdered turmeric. The dark blue

wool should then be put in, piece by piece, in small quantities, and the whole left to soak for a day. It should then be washed in the same water, taken out and dried in the shade.

Dark brown.—Follow the same process as for orange, but using raw red [brown or rufous] wool.

Light brown.—Take six pots of water mixed with one pot of thick chunam water. Into it put 10 lb. of white wool, and leave it to soak for a night. In the morning remove the wool, wash and dry it in the sun with three pots of cold water. Mix 1½ lb. of powdered catechu, one pot of log-wood water and 1 lb. of palmyra jaggery. Set the mixture on a fire, and, when quite boiling, put the wool into it, stir well, and when of the proper colour, remove and dry in the sun or shade.

Khāki.—(1) Take 10 lb. of white wool, leave it to soak for a day in a pot containing three small pots of water mixed with 4 lbs. of powdered gallnuts. Take it out and dry it in the sun.

(2) Dip the wool so dried in four pots of water mixed with 4 oz. of "*hirakasis*" (sulphate of iron), leave it to soak for 10 minutes; take it out and again dry it in the sun.

(3) Mix 1½ lb. of turmeric and ¼ lb. of alum well powdered. Put into three pots of water, and boil well. When quite boiling put in the wool, stir it well and boil it for 4 hours. Then remove the wool from the pot, and dry it in the sun.

(4) Mix together ¼ lb. each of arecanut, turmeric, fuller's earth and catechu, powder well, put into a pot containing about 2 measured seers of cold water, and wait for half an hour. Then take the solution little by little and pour it on the wool, taking a small quantity of wool at a time, until every one of the batches of wool takes up the right colour. Then dry the wool in the shade. The dyed wool is steeped frequently in water, to remove excess of colour.

The topping of dyed wool with aniline dyes is practised to give additional brilliance to the colours. The sizes and patterns most frequently demanded are 6 feet by 3 feet, and 7 feet by 4 feet.

The Persian flower design, and what is known as "Krishna Murti" pattern are those most commonly made. The jail does not send any carpets to warehouses for outside sale. For order trade "Persian flower," "Krishna Murti," "Hindu", "Herat" and "Scorpion" designs are in most frequent demand. Ordinarily mill spun yarn is not used. Spinning is done in the jail by convict labour. There has been a considerable fall in the price of wool in the past year.

	Clipped white.	Clipped black.	Clipped fawn.
	RS. A. P.	RS. A. P.	RS. A. P.
1903	7 0 0	6 8 0	4 4 0
1904	7 0 0	6 8 0	4 4 0
1905	7 0 0	6 8 0	4 8 0
Present price	5 14 0	5 0 0	2 14 0

NOTE BASED UPON INFORMATION SUPPLIED BY MR. C. KUPPUSAWMY IYENGAR, AMILDAR, ON THE BAZAAR CARPET TRADE IN BANGALORE CITY.

The exact number of weavers cannot be ascertained; the number varies with the demand for carpets. Ordinarily Messrs. Subbiah Chetty & Co. have 18 men working in their factory, and Messrs. Munisamiah & Co., 20 men. There are other weavers in Carpet street, but they do not employ any labour, the men and boys belonging to the family

themselves working. When there is increased demand, extra labour is employed. The average length of the looms in use is about 3 yards. The largest loom is 24 feet long.

Subbiah Chetty has 14 looms and Munisamiah eight looms. I have been to some other weavers. They have between them 13 looms. I was not able to find out the exact number of looms in use in the city of Bangalore. The Vice-President of the Municipal Commission informs me that, since the loom tax was abolished in 1897–98, no information as regards the number of looms is available. Some of the weavers combine agriculture with weaving.

All members of the families of the poorer weavers work at cleaning and spinning wool, and also at dyeing. In well-to-do families, this is done by the men and boys. In all cases, however, weaving is done by the men and boys only. The weavers buy the wool from merchants, who get the same from sheep owners in the District of Bangalore. In many cases, the weavers themselves buy the wool direct from the sheep owners. In the majority of cases, the wool is unspun at the time of purchase, and the weavers and their families tease, clean, wash and spin it.

The weavers are not prepared to give out the methods adopted in teasing, spinning, etc. Teasing is invariably done with the native bow, and spinning is done by the hand wheel. Five different kinds of wool are used.

Cotton, hemp, hemp and jute, jute yarn and thread are all used for the warps and wefts. It is left to the purchaser to select which of the above should be used.

Thread is generally purchased in the bazaars. Some of the weavers get it from the Bangalore Cotton, Woollen and Silk Mills (Limited).

The quality depends on the demand; the stitch count of carpets principally in demand being from 3 to 10 stitches per inch.

Weavers are paid for work done [piece-work], rates varying from As. 4 to Rs. 6 per yard according to the quality of the carpet woven. The quantity woven by a steady weaver also depends upon the quality of the carpet. Such a weaver can make about Rs. 10 a month.

Woollen carpets [known as webbing carpets], pile carpets and plush carpets—any kind of carpets—are made according to order.

Carpets are sent to England, America, and to many places in India. It is the well-to-do classes that export carpets. They advance money to poor carpet weavers, and get carpets made by them for export purposes.

The finest stitch grade carpet or rug that is made has 10 stitches per inch, and the coarsest has 3 stitches per inch.

The old vegetable dyes are the best and most costly; their colour is permanent and rich looking.

Aniline dyes are used for cheap carpets. They are less costly than vegetable dyes. They lose colour very soon. For very cheap carpets, pure aniline dyes are used. For ordinary carpets, aniline dyes are mixed with vegetable products and oil [*sic*] to make the colour fairly fast. For costly carpets, pure vegetable dyes are used.

Synthetic indigo is unknown to weavers here. The dyers in the bazaar use only indigo made in Mysore and the Madras Presidency, and no other.

The weavers are not aware of any of the processes adopted for dissolving indigo, as they do not dye in it. There are other people in the city who do, but they have methods of their own, which they consider to be trade secrets. The dyers know nothing of the processes for indigo dyeing mentioned in the question.

Various dye processes.—I have tried my very best to collect materials for answering these questions. I was not successful, as the weavers consider these as valuable trade secrets. No amount of persuasion on my part was of any avail. The weavers say that no two people adopt the same method, or use the same ingredients. More than this, they are not prepared to state.

Every weaver prefers running water to remove excess dye, but, as running water is not readily available anywhere near Bangalore, the dyed yarn is steeped in water several times, to remove the excess dye.

Topping with aniline dyes is practised to give brightness to dead dull colours.

There is not much demand for plush or pile carpets. There is a ready sale for ordinary or webbing woollen carpets. The sizes most in demand are 3 feet by 6 feet, 4 feet by 7 feet, and 6 feet by 9 feet. Such sizes are always in stock. Other sizes are made to order.

The carpets in stock are of very ordinary designs, mostly plain with floral borders. Those made to order are prepared in any designs which the purchasers require. Carpets exported are mostly plain, in buff or green colour, and with suitable borders. The quality generally in demand is 5 or 6 stitches per inch, the price being about Rs. 2-8-0 per square yard. Price varies from As. 14 to Rs. 14 per square yard.

Indigent weavers do not themselves export carpets; they sell them locally, or to the well-to-do weavers.

Carpets are sent to various firms in England, including the Cutler Street auction and sale warehouses in London.

Generally, designs accompany orders, and the carpets are made according to designs sent. Plain carpets are in most demand, as they last for a longer time than carpets with floral or other designs. The latter get torn at the flowers soon [*sic*]. In some cases designs, combinations of antique patterns or original European ideas, are sent out to be copied.

If orders are sent by firms of standing, carpets are woven on receipt of orders, and the full price of the same is paid when the carpets reach the shipping agents at Madras.

Ordinarily, weavers buy wool locally, and spin it themselves. They find that the locally spun yarn is cheaper than the mill spun or imported woollen yarn.

With local yarn, they are able to weave fine carpets. Sometimes, owing to dearth of local yarn, or if specially desired by customers, mill spun or imported yarn is used. The local weavers consider the mill spun or imported yarn to be very good stuff, though expensive. The carpets made with such yarn are proportionately costlier than carpets made with the locally spun yarn.

I could get information only about fleece wools, and nothing about woollen yarn. The price of a pound of wool in 1904 was about 3 pies less than in 1903. In 1905 the price of wool rose by about 6 pies per lb. and there has been a further increase of about 3 pies per lb. in 1906. The price of wool now ranges from 5 annas to 1 anna a lb.

THE WOOL IN THE CARPET.

Unlike most other textile materials, such as cotton and silk, wool is not the product of certain latitudes only, but may be said to be a product of all parts of the world. Few animals adapt themselves so readily to diversities of climate and pasturage as the sheep, and few are more susceptible to improvements induced by the care of man and selection in breeding.

The effect of the intense heat of the Madras plains is to produce a harsh dry brittle wool with little of the natural wool-fat, while the small amount of attention paid to the breeding of sheep results in great unevenness of fibre, and to the occurrence of a good deal of dead useless hair, which greatly diminishes the value of the wool.

Kemps, long harsh dead hairs, are frequent in almost all wools raised on the plains, and are not uncommon in most of the hill grown fleeces. They will not felt, and, not being serrated at all, will not keep their place or 'cling' in the yarn; they soon protrude and, if present in large numbers, give the carpet a ragged appearance. Kemps are said to indicate in-breeding. They take up very little dye, and no mechanical means of removing them from the wool appears to have yet been discovered. They are rarely removed, except for very fine quality carpets, and then before the yarn is spun.

"The best woolly breed of sheep in the Madras Presidency is, I learn, the Coimbatore breed. The woolly breed is known in Tamil as *Kurumbadu*, and the non-woolly breed as *Semmariadu*. Woolly sheep are met with in parts of the Námakkal and Perambalúr taluks, and of a few taluks of districts adjoining Coimbatore. The Coimbatore breed, being generally white all over, except the face, is a source of white wool.

"The black woolly Mysore breed is met with in the Bellary district and parts of Kurnool, but it is not so good as in its native Province, and the wool frequently degenerates into straggling hair.

"Neither the Madras nor the Nellore breed of sheep furnishes, according to Dr. Shortt, wool or hair good for textile purposes, and the Madras breed has the following wide area of distribution:—North Arcot, South Arcot, Chingleput, Ganjám, Gódávari, Kistna, Madura, Salem, Tanjore, Tinnevelly and Trichinopoly districts."

"In six out of the twenty-two districts, into which the Madras Presidency is sub-divided, viz., South Canara, Chingleput, Ganjám, Malabar, Tinnevelly and Vizagapatam, no woollen industry is now carried on." THURSTON.—'The Woollen Fabric Industry of the Madras Presidency.'

The 'Sáidápet Farm Records'.—C. Benson, 1885—are well worth quoting here. "Sheep . . . . . are extensively raised as a source of animal food, but as yet there is no general demand in the country for the supply of well-fed mutton. There appears to be no reason why over extensive tracts, Southern India should not compete in the supply of fine wools for manufacturing purposes."

The records tell us that the once well-known Saidápet breed of sheep "can be traced to a mixture of the Patna, Nellore, Mysore, and Coimbatore breeds" and that "up till 1880 the improvement in the quality of the sheep had been obtained by careful weeding out of the flock and the use of the best rams available." We learn that the imported Patna sheep and their progeny stood the dry, parching weather of April, May and June 1870, much better than the Nellore and Mysore breeds did; and that, "though grazed with the Nellores, and fed on the same food," the Bengal breed "suffered very little, and were always in fair condition," while all the Nellore sheep fell much out of condition and a considerable number died, as did a few of the Mysore breed. "Of all breeds—Nellore, Patna, Mysore, and Coimbatore—the Patna is undoubtedly the best." In 1880 "after small-pox had reduced the flock to half its former strength," two half-bred Southdown-Mysore rams were got from the Kunigal farm in Mysore. This cross showed better wool than that previously clipped, and the sheep were of a better character.

The Saidápet farm has proved that its breeding experiments have resulted in a great improvement in the wool, as well as the quality of the mutton raised on the farm. For "in 1872 a London wool broker reported that the two samples of wool sent to us for valuation are 'fair East Indian yellows,' worth here from 11*d.* to 11½*d.* per pound." When this valuation was made, "'ordinary' Australian and New Zealand wools were selling at an average of 1*s.* 2½*d.* per pound." Both the above prices were for broken pieces and locks, and not for fleece wools, which are worth much more.

Mr. Benson says:—"A good many years must yet elapse before the breed can become thoroughly well established. In view to the saving of time, it would be well to procure

from Northern Australia or Southern Europe a few rams of a short-wooled breed, in order that by judicious crossing the desired results may be hastened."

Wool in Mysore.—"Sheep are of three varieties, the "*Kurubar*" or ordinary breed, so called from the caste which rears it; the "*Gollar*," which is less common and which owes its name to the same cause; and the "*Velaga*," which is the rarest of the three. White, grey, brown, rufous, and black wools are found in all three breeds. The *Kurubar* is a small sheep, with horns curling backwards. Both its flesh and wool are superior to those of the other two varieties. The *Gollar* is distinguished from the *Kurubar* by its large size, coarser wool, longer neck and different formation as to the head and jaws. The *Velaga*, which is rare, is longer in the leg, and stands higher than the other breeds, but is less bulky and more resembles a goat in the structure of the body and limbs. The sheep of this variety are rarely shorn of their wool, it being generally too coarse for manufacture; they shed their coats once a year. This is the breed which is in Mysore used for draught and the carriage of children. The *Gollar* sheep are left out at night at all seasons and in all weathers, and do not appear to suffer from the exposure, while the *Kurubars* and *Valagas* are invariably housed at night. The different breeds are never mixed, chiefly owing to antagonism between the Kurubar and Gollar castes; but, even in the absence of enmity between the shepherds, it is doubtful whether the two varieties could ever be brought to mix, and it is pretty well established that the *Velaga* will not amalgamate with the other two. They are solely dependent on pasturage, never being fed on grain.

"Sheep are shorn twice a year, and fifty fleeces amount to about a pucka maund [82½ lb.] weight. The wool is all coarse. The shepherds usually hand over 100 fleeces to the weaver, who gives them in return a kambli.

"The woolly breed of sheep, which exists throughout Mysore, is fairly esteemed," says Dr. Shortt, "both for its mutton-forming and wool-producing qualities. The rams have large heavy horns, wrinkled and encircled outwards, and their points inwards and outwards. The head is large and heavy looking, with a prominent Roman nose. The ears are of moderate size and pointed, and the tail short, never exceeding 3 to 4 inches. The ewes are mostly hornless. The prevailing colour is from a light to a very dark grey or black. They have fairly compact carcases, with good width, prominence and depth of chest, the body is well wooled and rectangularly formed; in picked specimens the counter is full and the shoulder is fairly filled when in condition. The fleece never exceeds 3 to 4 lb., and the staple averages 3 to 4 inches in length.

"All the breeds of sheep in Southern India are pugnacious and reared to fight, the preference always being given to the black woolly breeds of Mysore or to those of Coimbatore. This breed extends from Mysore to Bellary, where after a time the wool frequently changes into long lank hair.

"For many years Sir Mark Cubbon had an experimental sheep farm at Heraganhalli, Nagamangala taluq. Merino rams were imported yearly from Australia, and the cross breeds distributed all over the country. The breed of sheep throughout the Province was thus immensely improved both as to size, quality of mutton, and wool. The wool was sent in bales by the Mysore Government to England for sale, as well as for the purpose of being manufactured into blankets and serge. The farm was given up in 1863, as it did not pay expenses. This was owing apparently to sheep-breeding alone receiving attention: if other branches of farming had been combined, the results would probably have been more favourable".—RICE. 'Mysore Gazetteer.'

It appears most probable that the importation of selected rams from the hottest districts of Queensland or South Africa, from the Persian Gulf or Arabia, or even from the North West Frontier Province, the Punjab, Upper Sind or Baluchistan [where there are excellent

sheep with good characters for their fleeces and carcases] would do much to improve the very poor breeds of Southern India. Such would probably live longer and give far better results than the bringing in of high grade rams from more temperate climates, for they would be likely to stand the heat well. These rams could be mated with selected ewes in the districts, and it appears to me that 40 or 50 such sheep imported annually for a few years would do a great deal to change the character, not only of the wool but of the mutton, in such districts as North and South Arcot, Chingleput, Ganjám, Gódávari, Guntúr, Kistna, Madura, Salem, Tanjore, Tinnevelly, Trichinopoly, and Vizagapatam.

Mr. J. M. Lonsdale, Agricultural Expert to the Court of Wards, Madras, points out that a necessary corollary to the importation of foreign rams for the improvement of Madras sheep would be the wholesale castration of inferior males. "The principle of the castration of the inferior multitude for the sake of the superior few" is acknowledged in all countries where breeding receives any real attention, and indeed it may be considered as the *sine quâ non* of the art of sheep breeding. It may be pointed out that, as a result of emasculation, a better growth of wool is obtained, and the animals are ready for the butcher much earlier than they otherwise would be.

The initial processes in the preparation of wool for spinning are sorting, washing, picking, teasing out matted portions by hand, cleaning and combing, but all of these are not necessarily employed.

Wool-sorting is in many cases not carried out at all, and is confined to the separation of black from white or coloured wool, or to the picking out of the worst pieces of wool, which are set aside for other purposes, or to be washed, or teased out with the comb, or by the pinjári or wool cleaner.

Hand-picking has to be resorted to in the case of wool grown in tracts abounding in thorny undergrowth, and especially for the removal of "burrs"—a process impossible to carry out in any other way than by careful hand-picking. Badly matted portions are usually steeped and washed, and then torn open if the washing does not open them out.

The pickers are usually women, and wages are very low, often less than 1½ anna per day.

The scutching or cleaning involves the beating and teasing out of the wool. The weavers often do the cleaning themselves, using an ordinary bow, the string of which is made of gut or of some strong fibre.

The bow is held in the left hand with the string partially buried in a little heap of wool, the operator being in a squatting position. The string is caused to vibrate either by being plucked with the right hand, or struck with a suitably shaped piece of wood.

If large quantities of wool are required, the wool is cleaned by a professional bowman, "*dhunia*," "*behna*" or "*pinjari*." [Tam. *panjukotti*, Tel. *dudhikotti*].

The instrument employed by him, known in Urdu as the "*dhenki*" or *pinja*, is a heavy bow, which is suspended string downwards, with the string resting some six inches from the floor.

A pile of wool is placed under the string, which is then depressed until it is well into the wool, when it is let go. The string is made to vibrate violently either by hand, or by being struck with a dumb-bell shaped wooden instrument called in Urdu the "*muttiya*." By its vibrations it opens up the wool, and frees it from all kinds of dirt which is neither very viscous nor prickly.

These professional wool and cotton cleaners are paid at the rate of about three pounds of wool for an anna; if the wool is very foul the rate is higher.

Wool-combing is rarely done in South India, because the staple of the wool is usually too short to admit of its being carried out properly. In the Northern parts of India much

hill grown wool is "combed," and this is occasionally necessary for the better of the Mysore and Coimbatore fleeces. A block of wood with iron spikes fixed closely together in it is used, the tangled and matted locks of wool are drawn quickly through and over it, and are thus torn apart and set in order by the spikes.

THE SPINNING OF THE WOOL.

Wool spinning is done with the *charki* or common spinning wheel, [Tam. *rattanam*, Tel. *rattanamu*]. It consists essentially of two parallel discs, the circumferences of which are connected by threads. Over the drum so formed passes a driving band, also made of thread, which communicates a rapid motion to the axis of the spindle. An end of wool is presented to the point of the spindle [Tam. *tharsuthum kathir*, Tel. *kandalsuttai soodhi*] which seizes the fibre with the aid of saliva, and so a thread is spun, the yarn being drawn away as the thread forms, as far as the spinner's arm will reach. The thread so formed is then slackened, and allowed to coil itself on to the body of the spindle, until the latter is full, when the yarn is removed in the form of a "kukri", cop or ball.

The process is exactly the same for wool as for cotton, except that in the former case the spindle is larger. Spinning is often carried on with the more primitive instrument named "*dherna*" or "*takli*" in Urdu. [Tam. *murukkum kathir*, Tel. *pendai soodhi*.]

This Shepherd's spindle consists of a fairly heavy wooden base, made of either a turned piece of wood or else of two pieces crossing at right angles, with a wooden axis rising perpendicularly to this base. The diameter of the base is usually about $4\frac{1}{2}$ inches, and its thickness about half an inch, the axis generally about ten or eleven inches long, and a little over half an inch in diameter. Both kinds of *dherna* are much the same in shape. Shepherd's spindles are often made from a stick or piece of bamboo, with a ball of unbaked clay on the lower end.

The raw wool is made up into "*punis*," or coils suitable for winding round the left wrist. The end of the "*puni*" is fastened to the end of the axis of the dherna by inserting it into a small slit in the axis.

The "*dherna*" is then spun round in the hand and, when it has got firm hold of the wool, it is allowed to hang in the air, supported by the thread which it is spinning, the right hand of the operator keeping up the rotary motion, while the left supplies the wool from the coil or "*puni*." "When the thread gets so long as to bring the "takli" out of reach or to let it touch the ground, the movement of the wool from the "*puni*" is stopped, and the length that has been spun is wound on.

The thread produced from the spinning wheel is naturally the stronger and more reliable, owing to the greater regularity of the motion of the spindle. The shepherd's spindle has, however, a great advantage in its portability, and in shepherds and women being able to take it and a supply of wool with them anywhere, and spin a little yarn whenever they have a few minutes to spare.

In Ellore and Masulipatam coarse hairy wool appears to be often made up into a weak ill laid yarn, by twisting it across the thigh. This is apparently only used for the commonest of export rugs; the "cutting off," and consequent unlaying, must take out almost all the twist in the pile yarn. This doubtless accounts for the short lives of some "trade rugs."

There are, in all the carpet districts, a certain number of persons, not weavers, who spin for wages, but their pay is miserably low, as not more than $1\frac{1}{2}$ to $2\frac{1}{2}$ lb. of wool can be spun in a day, and the wage for spinning two pounds of wool is only from 2 to $2\frac{1}{2}$ annas.

For double yarn laying, the charkhi can be used, and also a form of the *taku* [called in Urdu *masan*], the difference being that the upper end of the spindle is grooved for the reception of the twisted threads.

The woollen thread is opened [*kholai*], which is done as follows:—Two kukris are taken at a time, the ends of the threads are held together, running between two fingers, and the thread is pulled steadily off the kukris. This double thread is allowed to fall in heaps on to the ground, and is then wound into "lattias," hanks or skeins crossed over a pair of sticks, the hands, or on a frame. The wool in these lattias thus takes the form of a figure of eight, and each lattia weighs from 1½ to 3 lb.

"The physical structure of the wool fibre is very characteristic, and enables it to be readily distinguished from other textile fibres. Being a product of the epidermal layer of the skin, it is built up of an immense number of epithelial cells. When carefully examined under the microscope, the wool fibre is seen to consist of at least two parts, sometimes even of three.

"The external cells appear as thin horny plates or scales of irregular shape; they are arranged side by side and overlapping each other, somewhat after the manner of roof-tiles. The upper edges are more or less free, the lower are apparently imbedded in the interior of the fibre. In Merino wool the scales appear funnel-shaped and fit into each other, each one entirely surrounding the fibre. In hair they are more deeply imbedded; they also lie flatter and present but little free margin.

"This surface character plays an important part in causing the 'felting' of wool in 'milling,' etc., and the fining of the carpet yarn in the boiling processes of dyeing. During this and similar operations, in which a large number of fibres are brought into close and promiscuous contact, each fibre naturally moves more readily in one direction than in the other, and the opposing scales gradually become interlocked."

"It is an interesting fact that these disintegrated internal cells possess a greater attraction for colouring matter than the external scales, and the beneficial effect of the acidity of the bath, required in many cases of mordanting and dyeing, may possibly be ascribed to the opening out of the epithelial scales, and the exposure of the inner fibrous cells to the action of the liquid of the bath. This seems to explain also why 'extracted' or 'carbonised' wool dyes deeper shades and more rapidly than ordinary wool.

"When wool fibre is steeped in warm water, it softens and swells up very considerably, and, like all horny substances, becomes plastic, retaining any position which may be forced upon it, if, while the mechanical strain is continued, the moisture is more or less evaporated.

"The worth of any quantity of wool is determined by carefully observing a number of its physical properties, *e.g.*, softness, fineness, length of staple, waviness, lustre, strength, elasticity, flexibility, colour, and the facility with which it can be dyed. Fleece wool, as shorn from the living animal, is superior in quality to 'dead wool,' *i.e.*, wool which has been removed from the skin after death, if lime has been used in the process, but, if it be removed from the skins by cutting, the wool is practically equivalent to 'fleece wool,' indeed it is said to felt better than the latter. Individual dead fibres occur occasionally in fleece wool; they have been forced out by the roots previous to the time of shearing, and constitute the so-called 'overgrown wool.' This class of wool is comparatively harsh and weak, and it is said not to dye so readily as other kinds. This is the case also with the wool of an animal which has died of some distemper.

"*Action of alkalies.*—Alkaline solutions have a very sensible influence on wool, but the effects differ considerably according to the nature of the alkali, the concentration and temperature of the solution, and the duration of contact.

"Solutions of alkaline carbonates and of soap have little or no injurious action on wool, if they are not too concentrated, and the temperature is not higher than 50° C. Soap and carbonate of ammonia have the least injurious action, while the carbonates of potash and soda impart to the wool a yellow tint, and leave it with a slightly harsher and less elastic feel.

"This marked difference of action between the caustic and carbonated alkalies makes it an all important matter for every wool-scourer to know the exact nature of the agents he uses. Soaps should be free from excess of alkali, "soda ash" should contain no caustic soda, etc.

"Calcium hydrate [lime] *acts injuriously, like the caustic alkali,* but in a less degree. *It eliminates the sulphur from the wool, but thereby renders the fibre brittle.**

"Lant or stale urine is the detergent which has been employed for wool-scouring from the earliest times, and it is effective because of the ammonium carbonate it contains. Though still used, this agent has been largely supplanted by others, such as ammonia, sodium carbonate, soap, etc.

"Stale urine, used in the proportion of one measure to about five of water, gives excellent results in most cases. It leaves the wool clean and with its normal physical properties of softness, elasticity, etc., unimpaired, its disagreeable odour being its main defect. Ammonium carbonate is the most rational substitute for 'lant,' and represents, perhaps, one of the best alkaline detergents, especially if used along with soap; but it is still too expensive for general use. As a mild scouring agent for the better classes of wool, potash or soda soap is largely employed. Satisfactory results are obtained with these if the soap is of good quality, and free from excess of caustic or carbonated alkali. Other things being equal, the most soluble soaps are made from oleic acid. An average soap solution may contain 30–50 grammes of soap per litre of water. An addition of ammonia to the soap solution is frequently made for the purpose of increasing its detergent properties."

"The scouring agent most largely employed, either alone or mixed with soap, is sodium carbonate. When used with judgment and care, it leaves the wool but little affected, and being inexpensive it is well adapted for wools of medium and low quality. The injurious effects of using a calcareous or magnesian water are less marked with this agent than with soap, since the calcium and magnesium carbonates precipitated on the wool are of powdery nature and more readily removed. The presence of *caustic* soda must always be rigidly avoided."—'The Dyeing of Textile Fabrics' by J. J. HUMMEL.

In connection with the foregoing note upon the wool used in carpet weaving, its preparation, etc., the following extract from J. K. Mumford's valuable work 'Oriental Rugs' will be found of interest, as telling something of the preparation of the wool as practised in those older homes of the industry, Persia and Asia Minor.

Wool.—"After the sticks and other foreign substances have been dislodged, the washing and scouring is done. As to the best way of doing this, too, opinions vary widely. In Asia Minor and throughout the Trans-Caucasus the wool is washed many times in cold water, without being allowed to dry between the washings. When cleansed of dirt, and of the natural grease of the animal, it is placed in large granite mortars, called *tubecs,* and covered with a mixture of flour and water, or with starch. The men of the family pound and mix the mass thoroughly, with great wooden mallets. It is then taken out, placed in baskets and in them washed again for two or three hours in a running stream, until the last trace of the starch shall have disappeared. This washing is of scarcely less importance, in the eyes of the Oriental wool-handler, than the delicate operations of the dyers themselves. Much

* The italics are mine.—H. T. H.

depends upon the quality of the water. Soft water, of course, is the thing sought. Hard water necessitates the use of potash, which cuts the wool.

"The washing over, the wool is exposed to the sun to dry. About this proceeding the Oriental is equally fastidious. A particular degree of warmth, a precise amount of sun, and wind from a certain quarter are relied upon to work a marked superiority in the carpet, and where the wool is intended for fabrics of the first quality, or is ordered for the execution of a *farmaish* [made to order], the wool-worker will wait for weather conditions to his liking. Even in the spreading there is a knack essential to the best results in the finished goods. The drying besides being gradual, must be even.

"Refined by all these processes, the wool is weighed up, preparatory to picking and carding. There is a sad difference between the weight of the fleece as it comes from the shearer, and of the residue after all the days of washing, scouring and drying. About thirty per cent. is lost in actual dirt, and probably thirty per cent. more in animal oil, so that, though the average weight of a whole fleece, newly sheared, is about five pounds, it is a good one that nets more than two or two and a half.

"The old devices for picking or loosing the wool from the mats in which it is left after drying are as simple as they are odd. That in most general use is merely a huge bow, a strong, hardwood pole, seven or eight feet in length, strung with a stout gut. This formidable weapon, subdued to purposes of peace, is suspended by its middle from the ceiling, so that the cord just touches the heap of wool."

"Another invention consists of a solid block, or sometimes a heavy wooden frame, from which protrude upward, in close rows, stiff, perpendicular pins. The native, man, woman, or child, sits on the ground, Turk-fashion, and draws the wool again and again over and between these pins, a process which picks it apart and fits it for the spinning. This method is used only for wool which is of more than ordinary length. It was particularly in vogue until lately in those parts of Anatolia where the material is prepared for working in the heavy modern carpets. [This is often done in India to badly matted wool.—H. T. H.]

"The yarn hand-spun by shepherds, in the open air, is in great favour with the manufacturers, but the supply is small, since, as we have seen, the herdsmen, using only the selected wool, keep the yarns of their spinning for their own carpets. The old-fashioned distaff and spindle are preferred, and the use of a wheel for spinning is as much of a concession as the Oriental will voluntarily make to mechanical progress.

"Attempts have been made from time to time, by European firms, or their Eastern agents, to establish steam mills in connection with their weaving interests at Oushak and in other places. The proposition has always met with a loud protest from the wool-workers of the district, and the Government, in paternal regard for its industry, has refused to lend a hand.

"The yarn which is made in three grades, light for the weft, medium for the warp, and heavy for the piling—though in very fine carpets the light grade is taken for pile—is usually purchased by the firms for which the carpets are being made, and its cost checked up against the master of the looms, to be deducted from the money due on the completion of the work."

THE DYEING OF THE WOOL.

The great importance of dyeing, as the hand maiden of weaving, is perhaps best illustrated by the following brief mention of the history of the famous Gobelins and Beauvais tapestry factories, and incidentally of the great Savonnerie carpet works. In a small workshop, in a poor quarter of Paris, near the Seine, lived in A.D. 1450 one Gehan Gobelin, member of a family then in great repute as dyers at Rheims. Gehan, by dint of much patient experiment, discovered a particularly beautiful fast-coloured crimson dye, and a very beautiful blue. This family and their dye works prospered, for towards the end of the century we again find record of the Gobelins dye works—now supplemented by weaving; and in 1603 the brothers Jean and Philibert Gobelin, already established in fine buildings in the Faubourg Saint-Marcel, Paris, were joined, by order of King Henri IV, by two Flemish weavers, Marc de Comans and F. de la Planche, and there under royal patronage they inaugurated their tapestry works. From 1603 to this day the dyeing process has been carried on under the same roof as the tapestry weaving, and not only is all the wool for the Gobelin looms still dyed and prepared on the premises, but also that required for the Beauvais tapestry and the Savonnerie carpet works. In 1662 Louis XIV, upon the advice of Colbert, his finance minister, created and subsidized a royal manufactory of the Gobelins works under the title "*Manufacture des Meubles de la Couronne.*" At this time both the high warp process [on horizontal frames worked perpendicularly] and the low [on perpendicular frames worked horizontally] were in use there. A skilled workman in full practice on the high warp loom was able to produce about three square yards of the finest tapestry as an average year's work, the low weaver producing about a yard more in the same time. It is easy to ascertain by touch which of these methods has been employed for the production of any given piece of work; the high warp weave gives a somewhat fuller stitch, consequently the work feels firmer, and is less supple. At the present time only high warp looms are used at the Gobelins factory, those on the other system having been transferred to the Beauvais factory in 1825, many years after their use had been abandoned at the Gobelins.

At Beauvais, Aubusson, and the Savonnerie, the dyeing for a long time had a great deal of the character of old Persian carpet colours, and it was only after nearly a century that French taste began seriously to influence the character of the colouring. During the Commonwealth and the reign of King Charles II, numbers of weavers who had been driven out of France found homes in England and established themselves in Spitalfields, London, and at Mortlake in Surrey, where, long before, King James I had set up looms; which appear till then to have done little or no work.

The thorough cleansing and preparation of the yarn for the dyer is just as important as the dyeing itself, for no good dyeing can be done unless the wool has been put into a fit state to receive and absorb the colour.

The object of the washing or scouring is to remove all traces of grease and dirt, and to make the yarn soft, and absorbent enough to drink in the colour into which it is to be dipped. "The Institutes of Manu" ordain that silks and wools shall always be washed and purified with the saline earths.

The best and simplest method in use in India for this cleansing is as follows:—First soak the hanks of yarn in warm water [at a temperature of about 70° C.], and let it drain after a beating and rinsing in cold water. Then, to 10 gallons of boiling water in an ordinary dyer's copper or dye pot [which should be large enough to allow the wool to be put in without the risk of boiling over] add 4 lb. of crude carbonate or sulphate

of soda [Tam. *aplakharam*, Hind. *reh*]—that collected as efflorescence from salt-impregnated lands is quite good enough if there is not too much earth in it;—and 8 oz. of sajji, [an impure carbonate of soda and potash, which is got by burning alkali-bearing plants] and boil for a quarter of an hour. The wool in hanks is then entered, kept at the boil, and constantly stirred for at least an hour, or until experience shows that the wool has been well cleaned. After boiling, the hanks should be taken out one by one, and well wrung. As soon as possible they ought to be beaten and washed in many waters, until it is found that the drippings come away clear, then dry thoroughly in the sun.

It is important to remember that washing alone, even in many waters, is not sufficient altogether to take out dirt, grease, or excess colour after dyeing. The removal of these is much facilitated by putting the hanks on smooth stones, gratings or planks, and beating them thoroughly with stout sticks or canes. Several good washings, after this process, will carry off a considerable amount of dirt, grease or unabsorbed colour.

In some factories this beating appears to be done with heavy logs of wood. This to my mind seems most objectionable, as is, I think, anything which is likely to accelerate beyond a certain point the "felting" process in the yarn. The many ingenious mechanical processes in vogue in woollen mills for the cleansing of loose wools and of certain yarns, are all devised with a view to causing as little felting as possible.

It must be remembered that coarse thick yarn will require longer steeping and boiling than that which is thin, and of fine grade wool. Similarly very foul yarn will require a stronger bath and longer pickling than that which is fairly clean.

I have never been able to find any means of removing altogether the stench which is observed in dead, chunam, limed, or butchers' wool, and which is characteristic of carpets made of such wool, especially in damp or wet weather, without rendering the wool so harsh, rough, and brittle that it was only fit for use in the most inferior of carpets.

The treatment suggested by the Superintendent of the Vellore Jail in his note [*q.v.*] will probably remove all traces of smell, but, I believe, must render the wool hard, very brittle, dull and most unreceptive of colour. The "lime steep" is of course what is used for a less period by all the weavers for dead or chunam wool.

For light and delicate colours it is often well to give the wool a second washing. This is done by taking 2 lb. of the fruit of *Sapindus trifoliatus* [soap-nut] or the pods of *Acacia concinna*, crushing them, and boiling for half an hour in 4 gallons of water. Let the temperature fall to about 83° Cent., then enter the wool and leave it for 12 hours, keeping a slow fire under the vat. Take out and wash thoroughly.

Sulphate of Indigo—soluble indigo, sulphindolic acid, also known as Barth's blue, Saxony blue.

Add one part of indigo in very fine powder (this is most important, as the smallest particle of undissolved indigo will seriously affect the evenness of the colour and the dyeing properties of the solution) to three parts of commercial sulphuric acid, strength about 97·5, S. G., say, 1·830, [indigo acid]. Messrs. Parry & Co., at their factories at Marikuppum and elsewhere turn out a good commercial acid, and Mr. Maclure, Mount Road, Madras, is a large importer of excellent indigo acid. The mixture should be thus made:—Have ready a large stoneware jar with a wide mouth and tight-fitting stopper. This should stand in a large vessel full of the coldest water available, to prevent over-heating of the mixture. Pour in the acid and add the indigo powder slowly, stirring all the while with a long wooden rod, until it is thoroughly well mixed with the acid, and is of the consistency of honey. As soon as the mixture cools, close the jar and keep for 48 hours before use. During this time the jar should be in the sun as much as possible. This "*marubba*" keeps well for a couple of months, not longer.

Wool for dyeing with sulphindolic acid should be very thoroughly scoured, and steeped in a weak lime bath for several hours; it is sometimes so steeped for days. It should then be washed and beaten in several waters, wrung out, and dried. The quantity of sulphate of indigo in the dyeing copper will necessarily depend upon the colour value of the indigo and the shade of blue required, and experience alone can teach this. The bath should be boiling, and be stirred for five or six minutes before the wool is entered. The hanks of wool should be stirred and lifted frequently during the dyeing process. When the colour is right take out the wool, wash in several waters, and dip in an alum bath.

One great advantage of this process, as against the old and excellent, but more complicated forms of sweet and sour "vat," etc., is that there is no waste, for the wool, which has a peculiar affinity for indigo, will, up to a certain point, absorb every particle of colour, and leave the liquor colourless; and that the process is a very simple one. In the United Provinces most weavers dye their carpet yarns by this process. And it is in common use in the bazaars for woollens.

The dyer's acid often used in the carpet industry in North India, which, if made strong enough, is equal to all needs, is thus simply made of crude indigenous chemicals:—

For 1 lb. of acid take—

Copperas	1 lb.
Saltpetre	2 lb.
Rock alum	½ lb.
Sal ammoniac	4 oz.
Arsenic	1 oz.

Or the following—

Saltpetre	8 parts.
Sulphate of iron	8 parts.
Sal ammoniac	2 parts.
Alum	2 parts.

Reduce each of the above to a fine powder, and mix thoroughly; put into an earthen pot with a small mouth, [a little water is sometimes added] and fit to it an empty large-mouthed one, which has been soaked in water for half an hour. Put the pot containing the above drugs on its side on a fire-place, so that the large-mouthed one does not get the direct heat of the fire. Now lute the junction between the two pots with well-kneaded clay, so as to prevent the fumes from escaping. As the pots get hot and the chemicals dissolve, the acid held in vapour will pass over to the pot which is not on the fire. This latter should be frequently and liberally sprinkled with cool water, to keep it from getting too hot, and to assist the condensation. When the condenser begins to cool, and the hand can be laid on it without discomfort, the distillation has ceased. The pot containing the chemicals should be broken, and never be used a second time.

The steam in this process comes from the water of crystallization, which vaporises. Action ensues between the various chemicals, and a crude sulphuric acid, carrying some hydrochloric acid and arsenic as impurities, results. This acid may be concentrated to any desired strength by re-distillation and evaporation.

If it is desired to distil a large quantity of acid, specially strong and well fired pots should be made, the connection between the two pots in such case being made with a stout bamboo tube, which should always slope towards the second pot. This tube may with advantage be covered with old cotton cloths and kept constantly wet.

It is of course better in every way to use good and fairly pure acid, but this, although quite cheap, is difficult to get by rail in the small quantities which the weaver-dyer is able to purchase, living, as he generally does, from hand to mouth.

In dyeing with lac, cochineal and several other drugs, the above acid is frequently used, alone or with lime juice.

The following dyes were, I am informed, in common use in the Madras carpet weaving centres, Masulipatam and Ellore, and also, I understand, in Warangal. Some of them are still used, all appear to be good.

1. *Deep Yellow.*—For 50 lb. of wool, take 75 lb. of fresh *Butea frondosa* flowers, steep them in warm water, in a vessel sufficiently large to hold them and the wool. When the decoction is cold put in the wool, and let it soak for a day, lifting and moving it frequently. Take out the wool, dry it in the shade, after shaking it thoroughly. Boil it together with 9 lb. of powdered turmeric and 2¼ lb. of alum, until the colour is right. It will loose a little depth by exposure to the air and in drying. After the dyeing is completed soak for a few minutes in a bath containing 9 lb. of fuller's earth.

2. *Ordinary Yellow* is got after the above formula, but the alum should be reduced to 1¼ lb. The fuller's earth bath should be omitted.

3. *A good and fast ferment yellow* is thus obtained, steep the wool in water in which crushed pomegranate rind has been boiled, in the proportion of 3 oz. of the rind to 1 lb. of the yarn. Heat to about 90° C., when nearly cold take out the wool, rinse and shake it out, and dry it in the sun. Steep dried *Butea frondosa* and *Cedrela toona* flowers in water, 9 oz. of each of the flowers to 1 lb. of wool. Let this stand for three days, stirring well occasionally. Strain the liquor through a coarse cloth. For each pound of wool to be dyed add 2 oz. of coarsely powdered lodh [bark of *Symplocos racemosa*] to the liquor. Boil for an hour. Put the wool into the bath and continue the boiling for three hours. Lift and stir frequently. Take out the wool and steep it for an hour in "*sajjimatti*" and water [4 oz. of the earth to each gallon] wash thoroughly, and dry in the sun.

4. *A yellowish almond colour and sulphur and buff shades* can be dyed in the flower bath after the above yellow dyeing, but for these paler tones the final bath in sajjimatti must be omitted.

5. *A very fine yellow* is said to be got by boiling flour sulphur in water, with carbonate of soda and a little finely powdered turmeric [it may be noted here that the firmest and hardest rhizomes of turmeric should be selected for dyeing, in preference to the softer and more easily crushed ones]. The wool is boiled in this bath and afterwards dipped in various alkalis. The deepest yellow is got from a strong potash ley. I think the use of *Cedrela toona* flowers, instead of the turmeric, might be an improvement.

6. *A very fine range of purples* is said to have been thus dyed. Boil in a weak indigo bath, wash and dry. Then dye in a chay root bath, and again wash the wool and dry it. These processes repeated, are said to give a large range of tones of purples and violets, which are of great depth and brilliance. The red dip is often varied by the occasional use of a lac bath, instead of the chay root.

7. *Lac reds*—an old Nellore formula. Take butti lac 3½ lb., tamarind pulp 10 lb., alum 1½ lb., fuller's earth 4 lb., first boil the wool in water to which the fuller's earth has been added. Boil for half an hour, draw the fire. Then take out the wool, and wash it in several waters, until the drippings come away quite clear. Boil the lac in about six gallons of water. Boil the tamarind in five gallons of water, stirring until all the fibre and seeds have come away from the pulp. Strain this liquor off into another vessel, and, while it is still hot, add the alum to it. Now mix the lac liquor with about two thirds of the sour bath. Enter the wool, and boil until it has taken on the shade you require. As the liquor boils away add more tamarind-alum liquor, for the wool must not be allowed to come above the surface of the bath. Lighter shades are got by reducing the quantity of the drugs, especially of the lac. Darker ones by corresponding increases.

8. *Coppery red tones* are got by first dyeing the wool with *Butea frondosa* and *Cedrela toona* flowers, and mordanting with alum and a little saltpetre. The yarn should be well-washed and dried in the shade. Formula No. 7, is followed for the rest of the dyeing. The red is sometimes varied by substituting chay root for a portion of the butti lac, in this case the dye should be strained before the sour bath is added.

9. *A good red ferment dye* is got as follows. Butti lac is ground with water into a paste, to which is added a quantity of cold water which has been boiled. Boiled flour-paste, of about the consistency of treacle, is now added to the lac infusion, in the proportion of three quarters of a pound of paste to each pound of butti lac. The whole is well stirred for an hour. And the vessel left in the sun for two or three days. Now put the yarn into the vat, and let it steep for from two to three days, or until the colour is right. The yarn should be lifted and well stirred twice a day. When the colour appears to have set right in the yarn, cut off a little, and boil it for a few minutes to test its permanence. If satisfactory wash, and boil fast for a quarter of an hour, in water that has been slightly soured with lime juice, mango rind or tamarind, and to which a little alum has been added. Wash well, and dry in shade. Sun for an hour or two when quite dry.

10. *A good warm brown* is dyed by the use of the following, which suffices for 50 lb. of wool. Fresh *Butea frondosa* flowers 50 lb., sappan wood chips or saw dust 75 lb., turmeric 9 lb. Soak the wool in the *murkan marram* flowers for a day, moving it often. Then dry the wool in shade. Boil with the turmeric and dry again, and finally boil with the sappan wood, to which $1\frac{3}{4}$ lb. of alum should be added.

DYEING IN BANGALORE.—I found it difficult to get much detailed information from the carpet weavers. All admit that they are greatly indebted to aniline colours, but several of the weavers assured me that, for their best work, they use only natural dyes. I saw about a dozen carpets and rugs on the looms, nearly half the colours in these had certainly been dyed with anilines. But the deep blues in all of them were got with indigo. Some of the commonest and worst Italian and Austrian tar colours, which have been made for dyeing cheap cottons, are frequently sold to the woollen carpet weavers!

11. *Blues.*—Only one or two of the weavers dye with indigo. Most of the dyeing is done by several families of dyers in the bazaar, who work only in indigo. One of their methods of dyeing, said to be very permanent, is as follows. For 40 lb. of wool, take 4 lb. each of powdered indigo, and the crushed seed of *cassia tora*, Can., *tegassu bijay*, 8 lb. of "*chawla*" [a local alum impregnated earth, with a little soda in it], and 4 lb. of lime. First dissolve the powdered indigo in a large vessel nearly full of cold water, and stir for an hour. Then add the crushed cassia seed [which should have been boiled in half a pot of water for twenty minutes] and stir thoroughly. Dissolve the alum earth in boiling water, and add it to the mixture. Last of all put in the lime, little by little. [Sometimes the lime is put into the bath first, and the alum-earth last of all]. This vat has to stand for eight or ten days before it is ready for use. The wool is steeped *cold* for an hour at a time, until the right colour has been got. Several dippings will probably be necessary for a deep blue. Mordanting is said to be done with myrabolans, but this does not appear to be at all necessary. The indigo formula given by the Superintendent of the Bangalore jail (*q.v.*) is also followed in the bazaar.

12. *Yellows* of almost all shades are got with *Butea frondosa* flowers, turmeric and alum. With, often, a further dyeing with the flowers of *Cedrela toona*. This, I think, is done after the wool has been washed, dried, and treated with a weak cold vegetable acid bath.

13. *A good dull orange* is said to be got by hot dyeing with equal parts of the dried flowers of *Butea frondosa* and *Cedrela toona*. Two or three dippings are needed, and each dipping should be followed by a mordanting bath of alum and a little pomegranate rind.

Wash and dip in a weak solution of crude saltpetre. The proportions are said to be ten parts, by weight, of each of the flowers that have been used, to one part of saltpetre. The yarn should be dried after each complete dyeing. For a deep tangerine orange like colour, the wool is often first dyed a pale pink with chay root, or lac colour.

14. *Dyeing red with lac and chay root* are practised, and sour mango cuttings are used as an intensifier.

15. *A deep dark red* is got from sappan wood chips, cuttings or saw dust [*Cæsalpina sappan*]. It is generally used with lac, or chay root, mordanting is done with alum water, with often, after drying the yarn, a final dip in a vegetable acid as a brightener.

16. *Black* is often dyed with a combination that I have not known before. Naturally dark coloured wool is soaked hot, and often boiled, in a mixture of myrabolans and a black slimy mud, which is said to come from a swamp in some rice fields about 30 miles from Bangalore. I was told that almost all the black cumblies made in the Mysore State are so dyed, unless made from naturally black wool. I suspect there is iron in some form or other in this mud.

The Bangalore carpet workers are very careful in the sorting of the different natural coloured wools. A result of this is, that they are able to dye, fairly evenly, grey and brown wools, in many shades for which white wool is used in most other carpet weaving districts. The variety of colours found in fleece wools in the Bangalore market is very considerable, and ranges from creamy whites, greys, and browns to an intense black.

The following recipes for dyeing will also be found useful. Any ordinary shades of colour required may be obtained from combinations and modifications of them. Special attention is directed to the remarks regarding the varying strengths and colour values of dye-drugs which close this section of the monograph.

17. *A good range of browns and deep maroons* is thus got. Boil henna leaves with twice their weight of water. Steep the yarn [which should previously have been dipped for a few minutes in pomegranate rind water, and dried] for half an hour in the hot henna liquor. Repeat this twice or thrice, until the colour is right. Dry, soak for twenty minutes in clear lime water, and dry off in the shade.

18. *Black, Kala Siya.*—To six gallons of water add "bábul pods" [*Acacia arabica*], 6 lb., well burnt clay from old pots, or over-burnt bricks, in fine powder, 10 lb., sulphate of iron [Tam. "*anna bedi*," Hind. "*heera kasis*"], 2 lb. Boil for one hour, *stirring well all the time*, put in the wool and keep the water at a fast boil for three hours. Twist the water out of the hanks on two sticks, and wash *till the water runs away clean.* Shake out well and dry quickly. [All dyes with iron in them kill the wool sooner or later, as witness the fine old pattern pieces of Ellore weave in the Madras Museum.]

19. *Purple, "Sauzni," "Tyriani," "Secunder Badshah-ke-rang."*—To 4 gallons water add 1¾ lb. of very finely powdered "lac colour," boil for one hour, stir well. Now add slowly sulphuric or hydrochloric acid 3 ounces, enter the yarn and boil for two hours; slacken off the fire. Draw nearly all the dye off into another vessel, mix thoroughly with 3 oz. of sulphate of indigo [Tam. *avari*] and 11 oz. of alum [Tam. *padikharam*] and pour slowly down the side of the vessel, stirring the wool vigorously all the time. Or, better still, take off fire, remove the wool, mix in the indigo liquid and re-enter the wool, boil for ten minutes, and keep at a temperature of about 95° C. for two hours. Then draw, wash thoroughly, wring and dry in *shade.* To deepen or vary the colour add more lac, indigo, and alum, in the above relative proportions. Experience is the only possible safe guide here. Sometimes the indigo dyeing is done first, in which case the yarn should be washed, dried and re-wetted before treating it with the lac colour.

20. *Another purple.*—Use blue indigo dyed wool, add 2½ lb. of lac colour to 4 gallons of hot water, pour in 4 oz. of muriatic acid to sour the bath, boil from one to two hours.

A very good lavender colour, and an excellent lilac can be made in this way by watering the liquids, reducing the red and blue, and giving a weak "khar" bath after the wool has been dried.

21. *Light Blue, "Asmani," "Ferozi."*—This is best dyed with wool which has had a second "dhulai" [washing] in crushed soap-nut [rita]. Soak for half an hour in a weak hot alum bath, wash, enter while wet into a bath of 1½ oz. sulphate of indigo, and 8 gallons water, fix in an alum bath, and wash thoroughly, dry.

NOTE.—Always choose a bright day for all indigo dyeing, especially the paler shades. Dry in the shade.

22. *Orange, "Nairang."*—1¼ lb. *lodh* [bark of *Symplocos racemosa*], 4 gallons water. Boil for 20 minutes, then enter wool, boil for one hour; take out and place in a weak warm "khar" bath [1 lb. shell or stone lime to 3 gallons of water]. Boil for 10 minutes, then wash and dry in the sun as quickly as possible.

23. *Green, "Bagh-ke-sabz."*—Dye three times in strong solution of tesu flowers [*Butea frondosa*], then dye with "haldi," adding alum, until you have the tone of yellow you want as the foundation of the green. Then put into a sulphate of indigo bath of the required strength, boil for an hour till sufficient colour has been absorbed, allowing a little for loss in washing, wash and dry. If great brightness is needed, enter into a fresh bath *made properly* with a chrome or alizarine green of the needed shade. Do not boil too long, or you will kill the ground yellow. This tone is very often got by first dyeing in indigo, and then colouring with the "tesu" flowers and turmeric.

24. *Light green, Pea green, Bud green, Grape green.*—Dye to the required shade with indigo [Tam. *avari*] and with alum [Tam. *padikharam*], rinse and dry. Then dye with turmeric [Tam. *manjal*] and tesu flowers as in the foregoing, add a little acid drop by drop, wash, and dry in the shade.

25. *Pale green—"Pistai, Pistaki."*—Dye first in weak indigo bath, wash and dry, then dye with turmeric [*manjal*] and *Butea frondosa* flowers soured with muriatic acid. Wash and dry in shade.

26. *Peacock green, "Deep green," "Mor-ka-sabz," "Tamba-ka-sabz."*—Use only well scoured wool, otherwise the dyeing will be a failure. Afterwards give a khar bath, 1½ lb. stone lime to 4 gallons of water, and wash *very thoroughly*. Dye in a strong indigo bath, and wash well. Take "tesu" [flowers of *Butea frondosa*, Tam. *palor*], 24 lb. to 12 gallons water and "myrabolams" [*Terminalia Chebula*] 6 lb. to 12 gallons water. Boil the "harra" till it has become reduced to half, strain, boil the tesu flowers for half an hour, then add the harra water. Keep hot in this bath until colour is right. [Do not boil it.]

27. *Green, sabz.*—Dye wool in weak indigo bath, put into "pewar" [*Carthamus tinctorius* flowers] water. Dip in a hot bath of turmeric and alum and steep all night. Wring out, and dry in shade without washing.

28. *Olive green, Sabz Khaki.*—5 lb. harsingar flowers [*Nyctanthes Arbor-tristis*] to 20 lb. boiling water, steep all night, squeeze out the flowers and strain, add water till of the right depth, dry in the sun. Take "babul pods," powdered, 4 lb. and myrabolams [Tam. *kaddukai*] pounded 2 lb., mix well in water, and leave in sunshine till it ferments. Then add 8 oz. sulphate of iron [Tam. *anna bedi*], add all to the harsingar water with more water, dip *dry* wool into the solution, and leave till the right colour comes. ***Don't boil,*** wring only, dry in the sun or in a draught, and shake out well when dry. Don't dye this colour in wet dull weather.

29. *Red, crimson.*—1¼ lb. pounded lac colour, ½ lb. sulphuric or muriatic acid [the latter is the best], 4 lb. sour mango cuttings, 3 gallons of water. Boil, enter yarn, boil for 3 hours, draw wool, wash and wring. Dip in cold water just soured with acid, wring and dry. If great depth of colour is needed, add more lac powder, or give a second dyeing.

30. *Dark claret colour.*—The formula is the same, but the quantities of drugs are increased as follows:—Lac colour, sulphuric acid, lodh [*Symplocos racemosa*], sour dry mango, of each 1½ to 1¾ lb.

31. *Nutty brown.*—Make two baths with 2 gallons of water each, one of 1¾ lb. dried *Butea frondosa* flowers, the other of the same quantity of myrabolam [Tam. *kaddukai*], steep for 12 hours, then mix and add 4 oz. of catechu, enter the wool and boil slowly for two hours, remove, wring and dry in shade.

32. *Ruddy dark brown.*—Soak 1½ lb. of lac colour in 2 pints of water for 12 hours, add this to 4 gallons of water, stir thoroughly, and add 4 oz. of muriatic or sulphuric acid —the latter is best. Boil for 2 hours, wash thoroughly, wring and boil again in 2 gallons of water with 8 oz. each of pounded lodh [*Symplocos racemosa*], and dry sour mango. Pour off the water and cover until cold, then dry in the sun.

33. *Golden brown.*—Use thoroughly cleaned wool, steep 12 lb. of dry tesu flowers [*Butea frondosa*] in 12 gallons of water for a whole day, stir thoroughly, strain after settling, and enter the wool cold for 12 hours. Remove and drain off the water on a drying frame, wring lightly and dry in the sun, then repeat the whole process. Now boil with lodh [*Symplocos racemosa*] 1½ lb. and catechu 1 lb. in 4 gallons of water for about an hour. Put 4 gallons of water into a large pot with 1 lb. of unslaked lime, stir thoroughly, and enter the wool and the lodh-catechu liquor into it, remove the wool and cover it up till next morning. Wring lightly, and dry in the sun.

34. *Old gold.*—An excellent old gold is got from the above formula by varying the quantities of ingredients as follows:—lodh (*Symplocos racemosa*) 14 oz., catechu 8 oz.

35. *Rich yellow.*—For 30 lb. of yarn take about 25 lb. of the flowers of *Butea frondosa* (Tam. *manjal*), arrange the wool and the flowers in alternate layers in the dye copper, commencing with the manjal, and taking care that each layer of wool is hidden by the flowers before the next is put in. Fill the copper with tepid water [about 40°C.], steep for 20 to 30 hours, then remove and wash the wool well. Into a large tinned copper deg, half filled with water, put in 2 lb. of muriate of tin, stir well and heat to about 90°C. Then enter the yarn, and keep the bath just short of boiling for an hour and a half, stirring all the while. When the wool has taken the required shade remove it, steep it in a saturated alum bath, temperature about 65°C., wash well and dry in the shade. This bath has a good range of colour, which is regulated by the length of the steeping with the tesu flowers and the duration of the boiling in the muriate of tin solution. A good yellow is also got with "akalbir" [*Datisca cannabina*], turmeric and alum.

36. *Pale primrose yellow.*—Steep 8 lb. *Butea frondosa* flowers in 2 gallons of warm water, soak wool for 24 hours, stirring and lifting frequently; dry in the sun. Repeat the process as often as may be necessary to get the desired colour.

37. *Terracotta.*—Put 17½ oz. of powdered lac colour, dissolved in 4 oz. of dilute sulphuric acid, into 4 gallons of boiling water, stir for a few minutes, and enter the wool, adding more of the acid lac solution, remove, and dip in a weak pomegranate rind bath, with a little alum, until you get the desired shade. Wash thoroughly, and dry in the sun.

38. "*Coppery red,*" "*Arab red.*"—Powdered lac 3¾ lb., sulphuric acid 6 oz., water 12 gallons, boil, enter the scoured wool, boil for 1½ hours, boil for ¼ of an hour in a weak pomegranate rind bath, draw, wash. (2) Take boiling water 12 gallons, "manjit" 6¼ lb., sulphuric acid 12 oz., turmeric powdered [Tam. *manjal*] 8 oz., keep stirring well, boil at least three hours. This latter gives a dull yet rich colour.

39. *Strawberry colour.*—Take 1¼ lb. powdered lac colour and ½ lb. sulphuric acid. Add them to 6 gallons of very hot [not boiling] water, boil the yarn for an hour, then wash

thoroughly and wring as dry as possible. [*b*] Now take 4 gallons of water, 1 lb. each of lodh [*Symplocos racemosa*] and dry mango, bring to the boil, enter the wool and boil vigorously for one hour. Take out, wring and dry in the sun. Pale crushed strawberry colour is got by reducing the ingredients.

The following three formulæ are used extensively in the United Provinces. They are a little more complicated than some of the foregoing processes, but give excellent results.

40. *Red—crimsons, etc.*—Steep the wool and wash in pounded or crushed soap-nut water, steep for 12 hours, wash well and dry. Mix 8 oz. of lac finely powdered and 12 oz. of muriate of tin. Put this into boiling water, stir well, enter the wool; stir till the dye has been absorbed by the wool. Now mix 3 lb. of powdered lac, 2½ lb. muriate of tin and 1½ lb. cream of tartar. Draw the wool and put the mixture into the boiling water, keeping it steadily boiling. Enter the wool again, boil and stir for 2½ hours; take out and wash in cold water until the water runs clear, then fix with alum water. The lighter shades of red are got by reducing the quantity of ingredients. Terra cotta is got by boiling with sulphuric acid and a little lac. With more lac a claret colour can be got with the same formula. For reddish violet, treat as above. Then make a solution of 5 lb. lime to 40 lb. water, drain off the clear lime water and steep wool in it for a few minutes, watching to see that the colour does not go off too much. Any shade from dark-red to violet can be obtained.

41. *Another red* in common use by the dyers of North India is got with myrabolans and the root of the ál plant [*Morinda citrifolia*]. The process is as follows. Steep the yarn for a couple of hours in a hot solution of powdered myrabolans, one part of the drug to fifty of water [temp. about 65° C.]. Wring out the wool, and dip into an alum bath, wring the yarn again, and enter into a strong hot bath of powdered ál root and water. Boil for an hour and a half, dip again in the alum bath, wash, wring and shake out, and dry in the shade. This recipe should also answer for chay root dyeing.

42. *Dark-green.*—Steep the wool in weak lime water, wash and dry. Steep and weight the wool for 12 hours in a hot bath of finely powdered turmeric [Tam. *manjal*]—[6 lb. turmeric to 40 lb. water]. Boil with sulphate of indigo [Tam. *avari*] until the required shade is got, and after wringing wash in an alum solution. Lighter shades of green can also be got with this recipe, using less indigo. Often the indigo dyeing is done first, and the green got with turmeric [Tam. *manjal*] and safflower [Tam. *kasumba*]. In this a bath of vegetable acid, such as mango pulp or tamarind, is used to kill the alkali and fix the colour.

43. *The barberry* [*Berberis*] grows in the Nilgiris, and is said by Leschenault de la Tour to be known there as "*jackalow.*" It is the yellow wood ["Barbary wood,"] of the European dyers, and the *dar huld* of the Persian dyers. Both root and wood give a rich yellow dye. It is usually mordanted with a vegetable alkali and then cleared with vegetable acid.

44. *A fine deep and permanent red* is got with manjit. The wool is first steeped, cold, in a strained decoction of oak galls or myrobalan, dried, and then entered to a hot madder vat. Mordant with alum. Chay root would doubtless give a good red if used as above.

45. *Lac gives a beautiful scarlet* rivalling cochineal, if the vat is worked with muriatic acid and mordanted with a "tin spirit." It is said by Dr. McLeod to give a brilliant scarlet, if the lac is first digested, warm, with an alkaline solution of the leaves and stalks of *Memecylon tinctorium*, and the wool, after a first mordanting in a "tin spirit," entered to the hot lac decoction.

A number of other useful dye formulæ will be found in Mr. Cloney's notes on the industry in the Vellore Central Jail, and in those by Dr. P. S. Achutya Rao of the Bangalore Central Jail, Mysore State.

Below will be found a number of dyer's instructions from an old manuscript book. The dyer who owned it said that they had been copied from an old Persian book of dyes and dyeing directions, which had belonged to his grandfather. He claimed descent from twenty generations of dyers, who originally came from Tabreez in Persia.

It will be noticed that no quantities of either dye-drugs or water appear anywhere. Hence it is clear that the recipes were intended for an experienced dyer, who, knowing the nature and colour properties of the drugs, could, without much trouble, secure the colour indicated, and in the shades needed for his work.

I have tried several of these recipes. It took a good deal of time to get the right proportions, but the results were well worth the labour. I am sorry to say that I have mislaid the notes I then took. All were quite as fast as the majority of other Indian dyes.

All the drugs and chemicals should of course be well powdered or crushed, the finer the better. For the steeping of drugs a good deal of water should be taken, enough to much more than cover them, and the liquor should be very often stirred unless the duration of the steeping points to a ferment dye, in which case the stirring should not be allowed after the first few hours. The wool in the "cold pot" must be frequently lifted and stirred. The direction to "cook" of course means to boil. During boiling, the wool should often be stirred and lifted, so as to give each hank of wool its fair share of dye, and to secure evenness of colour.

46. *Almond colour.*—Take oak galls, *Quercus infectoria*, kadukkai in *Tam.*, karakkaya, *Tel.*, [myrobalan should be a fair substitute.—H. T. H.], dry skin of the pomegranate, Indian madder [*Rubia cordifolia*], soak for 12 hours, put in some alum, and steep the wool for a day and a night. Let the pot be in the open and uncovered, cook it for 3 hours and wash with a beating, dry in the shade.

47. *Birbuls' blue.*—Take cinnabar, indigo and alum, grind and sift finer than the light dust of the high hills, soak for ten hours, keep stirring it, put in the wool and soak for many hours. Boil for three hours, wash in curd water, water in which curds and whey have been well beaten up, leave for three hours, and then wash and beat again in water. [There was an old Persian custom of washing the dyed yarns in fresh milk and water to which certain drugs had been added. This gave brilliance to the colour and a rich deep gloss or bloom. Curds in water were used with a similar object. And valuable old carpets that have been washed and "restored", are said to be treated with milk in which some drugs have been dissolved, but the secret is in the hands of a few Persians and Armenians who keep it to themselves—H. T. H.]

48. *A fine Indigo blue.*—Take indigo, soak it in water for 12 hours, grind it to a fine paste in a mortar, add some *Terminalia citrina*, pomegranate peel and alum, and mix thoroughly. Boil, put the wool into the hot bath and keep stirring till cold. Now mix in some iron filings-water and boil steadily for another two and a half to three hours. Wash with a beating, and dry.

49. *Ruddy brown.*—Take seed of *Cupressus sempervirens*, bark of *Terminalia belerica* (tanikkai—*Tam.*, tandrikaya—*Tel.*)—[*T. Chebula* or *tomentosa* might answer—H. T. H.], oak galls (or myrobalans) and soda. Soak two hours in hot water, steep the wool for twenty-four hours, afterward boil for three hours, add some hot alum water, and boil for one hour. Wash very nicely, and dry in shade.

50. *Ruddy brown-grey.*—Take sulphate of iron, *Terminalia citrina*, oak galls or myrobalans [masikkai—*Tam.* and *Tel.*] and alum, mix well, dry, then steep for twenty-four hours. Put in the wool, soak it for 24 hours, then boil for two or three hours. Dip in a soda bath, wash and dry.

51. *Camel colour, fawn, pale browns.*—Take pomegranate rind [madalai—*Tam.*, dalimba—*Tel.*] *Rheum Moorcraftianum*, babul [*Acacia Arabica*—karu velam—*Tam.*, nallatumma—*Tel.*] seeds and pods, and soda. Soak for an hour and a half in hot water, steep the wool for thirty-six hours, then cook for two hours, add the alum, and cook again for an hour and a half. Wash very well fifteen times and dry quickly.

52. *Cinnamon.*—Take oak galls [myrobalans should do as well], Acacia bark, cinnabar and alum, and steep for a night. Put in the wool and soak for twenty or thirty hours, boil the wool for two or three hours, and give a soda bath. Wash, dip in acidulated water, and wash again with beating.

53. *Crimson.*—Take lac colour, and cochineal. Steep for from four to six days in the sun, in hot weather for the lesser time, stirring constantly till a rich deep colour comes when some has stood a few minutes in a thin glass bottle and settled. Then strain through two cloths, and put in pomegranate rind and good iron filings-water. Add mineral acid, steep wool for thirty-six hours, then boil for three hours, wash well and dry.

54. *Pale green.*—Take *Datisca cannabina*, turmeric, pomegranate rind and iron filings-water. Let these soak for twelve or fifteen hours, then put in the wool and soak for a day and a night. Now take out the wool and add to the bath indigo and alum separately; return the wool and boil for two and a half hours. Wash with beating and dry in shade.

55. *Pale greyish green.*—Take copper rust, asburg [Stavesacre, the flowers and stalks of *Delphinium zalil* or *saniculæfolium*, see No. 57] and alum. Mix well with very hot water, not boiling, soak wool for eighteen hours, then boil for three hours. Give a bath with water acidulated with sour limes, and dry in shade.

56. *Yar Khans' green.*—Take turmeric, pomegranate rind, *Datisca cannabina* and iron filings. Soak all night, steep the wool for a day and a night in the open air, take out the wool, add first some alum and then nil-ka-marubba [sulphate of indigo] to the bath. Stir well, boil the wool for three hours, or till colour is right, wash fifteen times with beatings, and dry in shade.

57. *Old gold and rich yellow.*—Take turmeric and asburg, [Stavesacre, the flowers and stalks of *Delphinium zalil* or *saniculæfolium*, a little herbaceous plant found on almost all the small low hills of the Himalayas between the Jhelum, the Sutlej and the Indus. This colour is also available, under the same name, in lumps, and as a coarse powder which comes from Afghanistan. As the colour is richer and fuller than that got from the plants, it is likely that the Cabul drug contains some other ingredient. With alum as a mordant asburg gives a very fine and fast dye—H. T. H.], cinnabar and alum. Soak all night, steep wool for twenty-four hours, boil for four and a half hours, wash with a beating, and dry in shade. [Several dippings in asburg are needed for deep tints H. T. H.]

58. *Pearly grey.*—Take soda, *Nyctanthes Arbor-Tristis*, [*parijatham* in Tam. and Tel.] and *Butea frondosa* flowers, soak for twelve hours, and steep wool for twenty-four hours. Then boil for three hours, wash, dip in alum bath, and dry in shade.

59. *Dark Grey.*—Take of the fruit of *Cupressus sempervirens*, seeds and seed pods of bábul [*Acacia arabica*], iron filings-water, and alum, steep for one night. Now add the wool and let it soak for twenty-four hours, then boil for two or three hours until the colour is right, then wash and dry in the sun.

60. *Silvery Grey.*—Take seeds and pods of bábul [*Acacia arabica*], bark of *Terminalia belerica* [*T. Chebula* or *tomentosa* would probably answer as well—H. T. H.] and tamarind, mix and steep for a night. Dip wool for twenty-four hours, boil for an hour and a half, rinse and wash in weak lemon or tamarind water, and dry in shade.

61. *Pearl colour* [also silver and old silver with slight variations of quantities].—Take bábul [*Acacia arabica*] seeds, *Terminalia belerica* [*T. Chebula* or *tomentosa* might answer

as well—H. T. H.], tamarind [*Tamarindus indica*], and fine white lime, steep these for a day. Then dip the wool for 24 hours, cook for a couple of hours, make an acidulated water bath and dip. Then wash and dry. [Add a very little lac colour or manjit in another bath if a glow of red is needed in the grey, or a very little indigo for blue, or both for a purple or a violet grey—H. T. H.]

62. *Rose-colour.*—Take ratanjot [*Onosma echioides*], a thought of cochineal, manjit [*Rubia cordifolia*) or lac colour a very little, and cinnabar. Add water, soak them for 12 hours, put in wool and steep for 36 hours, cook it for three hours, then bathe the wool in alum, and wash nicely, afterward dry in the shade.

63. *Persian Scarlet.*—Take lac colour, and, if you choose, a little cochineal for richness, and soak from four to six days; strain it in two cloths and add alum, and a little turmeric; let it stand three hours. Put wool in and steep 24 hours, then boil for two hours. Take out the wool and add mineral acid; re-enter wool and boil an hour more. Wash fifteen times when cold, and dry in the shade.

64. *Saffron Yellow.*—Take turmeric, cinnabar and soda, add water, and keep for a full day. Then add some alum, make the dip and soak the wool for 30 hours, cook it for several hours, and dry in the shade after beating and good washing.

65. *Brownish Pale Yellow.*—Take flowers of *Cedrela Toona*, cinnabar and turmeric, soak for a day and night, add flowers of *Nyctanthes Arbor-tristis*, soak the wool for the same time, keep the bath well stirred from the bottom, and lift the wool very often. Put in alum and boil for three hours, wash and dry in shade till nearly dry, then put into the sun.

66. *Deep Dull Yellow, Yellow Brown.*—Take oak galls [or myrabolans], rewand, *Rheum Moorcroftianum*, and pomegranate rind, and soak for a night in water. Then steep the wool for 24 hours, add lime and sulphate of iron, and boil for two or three hours, wash thoroughly and dry in the sun.

67. *Rich Yellow.*—Take asburg [see Nos. 55 and 57] and turmeric, soak for a night in water, steep the wool for twenty-four hours, add alum, shake out and dry in shade.

68. *Mixed red and black*, blue and black, yellow and black, and green and black yarns, are got by spinning together and dyeing equal parts of black and white wool. This is scoured in the ordinary way, and the white wool in the yarn dyed by almost any of the foregoing processes. It occasionally happens that the black wool takes on a tinge of the colour. This, for red and black, is said to be avoided by the following treatment. Mix finely powdered lac colour with water, add barley gruel to it, and stir well until the gruel is well mixed into the water [rice gruel would probably serve the purpose equally well]. Keep this for a few days, or until it takes on a distinct reddish tinge, then stir the bath thoroughly, enter the wool, and stir again for half an hour, lifting the yarn often. Leave it until the wool has taken on some colour, then wash well, and put into a bath of lodh [*Symplocos racemosa*] and dry unripe mango, and boil. When the colour is right, remove from the fire, and leave it until the liquor has cooled to about 60° C. Then wash the yarn thoroughly, and dry in shade. Variants of these colourings are got by spinning together equal parts of white and brown or grey wools, and dyeing as described above. In woollen mills loose wools are dyed separately, and mixed coloured yarns made up as needed. This is much the simpler process, but there is doubtless good reason for the old weavers' way.

I have got some fast and useful dyes in shades of fawns, and reddish and yellowish browns, from padaukwood, jackwood and rosewood sawdust, and using myrabolan or alum, sometimes both, as mordants. A great deal of sawdust is needed to get a good colour. It should be steeped cold for 12 or 14 hours and frequently stirred. Then put on the fire and boil for an hour. The liquor should be strained off when cold, and boiled up when needed

for dyeing. The wool should be wet when entered. Add the mordant to the boiling wood-liquor bath a little at a time, and boil all together for about two hours. Sappan wood, Brazil wood and logwood are also useful dyes, both alone and in conjunction with other tinctorial drugs. The mordanting should have careful attention.

Dye baths which contain turmeric in large quantity should not be heated above 60° C. In using this drug the hard firm rhizomes, which carry the richest colour, known to Hindostanee dyers as *lok-handi-ka-haldi*, should be carefully selected in preference to the soft easily crushed ones which are best used as condiments. Before powdering the drug it is well to steep the rhizomes in a weak lime juice and alum bath for 24 hours, borax is much better, but is more expensive than alum.

Alum is of special value to the dyer, and it is not made as much use of as it might be. It is often advisable to boil clean wool in a weak solution of common alum, with or without a little mineral or vegetable acid or cream of tartar. Apparently an insoluble compound of alumina is formed in the wool, and becomes a basis upon which many tints, especially the lac colours, are well dyed. The yarn should be dried in the sun after this dip.

It is sometimes found necessary to add to the dye stuffs in a vat full of yarn. In such a case it is advisable to take out the wool, and put it into a clean vessel while the drug is being added. If colour is added to a vat "in work," there is always a risk of the wool on top taking up excess colour.

Carpets are sometimes made without any dyed wools being used in them. Natural blacks, browns, rufous shades, greys, drabs, fawns, buff, and yellowish and creamy tinted wools, are carefully hand-picked, sorted, and spun into yarn. Handsome uncommon looking carpets are made from these natural coloured wools. They are cool looking, restful, and quiet and low in tone. But the hand-picking and sorting give a good deal of trouble, for they need a fair idea of colour in the sorter, and careful watching. Weavers and firms in the trade are not very keen in canvassing for orders for such carpets, although the absence of any dye means an appreciable saving. The wool for this class of carpet is usually washed "in the loose," and then spun into yarn, this being afterward further cleansed with soap nut. In the making of decent class "undyed" or "natural" carpets the "lime steep" should never be used, because it sometimes affects the colour of the wool, for this reason such carpets should never be made from chunam wool.

I have purposely avoided any mention of the processes followed in the use of aniline, alizarine and chrome-alizarine colours.

Reiman, in his 'Hand-book of Anilines,' tells us that, when aniline colours began to appear on the market in 1860, blues and the "fearful magenta" were the first to be introduced. "Less than a year afterward it took ten factories in Germany, Italy, Switzerland and England to produce these colours.

"Whilst the manufacture of aniline colours thus became European, their consumption spread still farther, and now could be observed this unique fact in the history of commerce the West supplied the East with colouring matter, sending its artificial dyes to the confines of the globe, to China, to Japan, to America and the Indies—to those favoured climes which up to the present time had supplied the manufactories of Europe with tinctorial products. This was a veritable revolution. Chemistry, victorious, dispossessed the sun of a monopoly which it had always enjoyed. . . .

"The reduction in the price of aniline colours is such that all manufacturers who use colouring matters have found it worth while to replace their former tinctorial products by these artificial colours. Besides this, the employment of these products has greatly simplified the formerly very complicated and costly operations and processes of dyeing, so that an apprentice can obtain as good shades as a skilled workman. This facility of application has

certainly not less contributed to the success of coal tar colouring matter, than the richness and variety of the shades.

"Everything, therefore, leads one to imagine that ultimately the natural will yield entirely to the artificial colouring matters. THIS REVOLUTION, the influence of which will be most important, since it will liberate for the production of food many hands now employed in industrial operations, WOULD ALREADY HAVE TAKEN PLACE IF THE ARTIFICIAL COLOURS HITHERTO DISCOVERED WERE AS SOLID AS THEIR RIVALS."

Of anilines there is little good to be said. Some of them are quite fast in cottons, and a few hold well in wool. But none of them, no matter how skilfully applied, are sufficiently fast to light or time to render them fit for use in decent carpet-weaving. Besides this, they usually fade most irregularly. Greens go off in a very short time into dirty looking brownish-greys and dull uninteresting greeny yellows, often flecked or spotted for a time by small patches where the colour has taken firmer hold. Reds go off to dull red-browns, or to undefinable pinky-reds, and the tips of the wool often show white in places. These fadings of course seriously affect the whole colour-scheme in which the carpet was designed.

It appears practically impossible to do anything to stop the use of the common aniline colours. Good indigenous dyeing requires care in the selection, as well as in the use of drugs and dye-stuffs, which are often difficult to get, especially in the small quantities in which the ordinary impecunious weaver is able to purchase them. Every village shopkeeper has a range of the cheapest and worst anilines, at prices varying often from six to ten annas the pound tin, and all the weaver-dyer has to do is to purchase a few ounces or a tin of the colour he needs. A pot of boiling water and some vegetable acid, alkali or alum does the rest, and the dyer has thus at hand all the material for the colouring of a carpet in as many tints as Joseph's coat.

The alizarine and chrome-alizarine colours are many of them quite as fast as, or faster than the old vegetable ones, but their proper use needs a certain amount of skilled training, the possession of exact scales and weights for getting out very minute quantities, and a certain number of fairly pure European drugs. Used improperly, these alizarines are probably worse in their power to change and disappear than are the commonest of anilines.

Many of the best of these colours have not been on the market long enough for one to be able to decide whether their "ripening," or fading, is likely to be in the direction of "softening down," as is the case with most of the old vegetable colours. With the fade-results of the anilines before one it is difficult to say just what will happen. Some years ago I dyed a little wool with high-class chrome and alizarine dyes, and in five or six colours. The darker tones stood exposure to sun and dew for three months quite as well as wool in similar shades, dyed with the old drugs. The paler tones "went off" much faster. In some cases the fading of the chemical dyes was in the same direction as the old colours, but in a few others weather completely changed the character of the colour.

The high grade synthetic indigo which I exposed to the same test, along with some good Behar indigo, did its fading just as the Bengal indigo did, and, the yarns being from the same hank, it was only the labels that showed me which was which.

In closing the Section on dyeing I would invite special attention to the fact that, in dealing with these indigenous dyes, and crude unpurified minerals, much latitude is necessary.

Both indigo and lac colour vary considerably in quality, richness and the amount of colour they give up, and it may very often be necessary to increase or reduce considerably the quantities mentioned in the recipes. By lac colour I mean the cake colour from *Coccus lacci*, or "butti lac." It is got by straining, and the evaporation of the infusion which remains

after the washing out of the stick lac in the process of making shellac. It gives quite as good colour results as does the fresh lac, and is much less troublesome to prepare. Similarly turmeric, lodh [*Symplocos racemosa*], tesu or porasam flowers [*Butea frondosa*], mango acid, myrabolans, manjit [nunám or chay root], and almost every other dye drug and indigenous mordant, varies greatly in quality. The conditions under which they have been plucked or cut, or dug, the soil in which they were growing, the manner of the drying, and the weather at the time of drying, are all factors which seriously affect their tinctorial value, and have to be considered and provided for. So, as I have said before, it is necessary to use these drugs with discretion. "Festina lente" and "Experimentum docet" are both mottoes which should be graven in every dyer's memory.

There is in existence a bulky lithographed Persian book, in which many details are given for old fashioned Persian dyeing. I think the Government of India might well obtain a copy, and have it translated into English and Urdu. The assistance in the translation of someone with a knowledge of Persian and also of the old fashioned, and usually unscientific, methods of getting these beautiful and permanent results, would be a desideratum.

There is no doubt that the work of the old Indian carpet dyers was almost as permanent and rich toned as that of their Persian compeers, for the processes and drugs must often have been nearly identical. The Emperor Akbar started the Royal Carpet Factory at Lahore about 1580 A.D., with master dyers and weavers from Persia. And there is definite evidence that many of the beautiful carpets which are amongst the treasures of H.H. the Maharájah of Jaipur, were made in Lahore quite early in the Seventeenth Century. The magnificent portfolio on 'Asian Carpets in the Jaipur Palaces,' in which Col. T. H. Hendley, C.I.E., I.M.S., [retired], has so sumptuously illustrated these truly royal products of the looms, shows how, in spite often of neglect and hard wear, most of these old carpets have withstood the attacks of time. Some of them have mellowed and ripened to a wonderful softness and delicacy, while the colours in others are still fresh and brilliant. At Ahmedabad are two or three very old carpets, which came from the Lahore factory. And some of the fine old carpets at Bijapur were undoubtedly made in the same factory. That the Jaipur carpets are in much better condition than those at Ahmedabad and Bijapur, is doubtless due to the dryness of the air in Rajputana.

John Baptista Tavernier, the French gem trader, in his 'Voyages through Turkey into Persia, and the East Indies,' [*Paris*], 1652, thus writes of the textile arts in Southern India—"The collourings of those carpetts which are made in India, do not last so long as the collours of those which are made in Persia; but for the workmanship it is very lovely. The eye of the Broaker is to judge of the largeness, beauty and fineness if those carpetts which are wrought with gold and silver, and see whether they be fine and rich. 'Chites' or painted Calecuts, which they call *Calmendar*, that is to saye done with a pencill, are made in the Kingdom of Golcondah and particularly about Masulipatan. . . The chites which are made in the Empire of the Great Moghul are all printed; and nothing so beautifull; neither for the figures and the collour, nor the fineness of the linen."

In his valuable work on 'Oriental Rugs' [probably the best general description of the Persian and Turkish Carpet Industry that has yet been written], Mr. John Kimberly Mumford tells of the immense number of plants which the Persian dyer brings to his aid. The narrative is so interesting and instructive, that I have ventured to extract a good deal from the Chapter upon 'Dyers and Dyes.' The methods of using many of the dye-drugs mentioned appear to have been altogether lost by Indian dyers.

"In parts of Persia and India dyers habitually wash the yarns in a solution of lime before applying the dyes. The object of this is to increase the brilliancy of the colours, but its principal effect is to make the yarn brittle, and materially lessen its wearing quality.

Where this treatment has been applied, an expert can usually detect it by feeling the pile of the rug.

"The distinctive feature of the old Eastern dyeing system was that nearly every tingent was of vegetable or animal origin, and that similar ingredients were employed for mordants or fixatives. The treatment of the yarn, with borax, saltpetre, tartar, copperas and the like, was not known. The native dyers held to the merits of the old fashioned mordants—valonia, pomegranate-rind, sumac, divi-divi, and the barks of different trees from which they had for so long obtained such renowned results.

"The best expression of the dyers' skill is undoubtedly found in reds. In what appa rently contradictory colours the yarns are dipped, to lay a foundation for the ultimate shades of red, is past finding out. Madder, the root of *Rubia tinctorum*, ground and boiled, is a basis for a multitude of the reds of the Eastern carpets. [Manjit, nunám or chayroot, and Indian madder, come from sister plants.—H. T. H.] Its flowers, too, are steeped, and the liquid made from them fermented, to secure some extraordinary shade of this colour. The red most common in Persian fabrics is made by combining alum water, grape-juice and a decoction of madder, and drying the yarn in a particularly moderate sun. Many degrees of redness, from pale pink to intense and glowing scarlet, can be made from madder alone, by different treatments, and in combination with other materials it plays a part in half the hues which appear in Eastern carpets. One of the oldest Oriental dyes is sheep's blood, from which, by secret method, a rich and enduring vermilion is obtained.

"Another material for deep red is kermes [lac colour from *Coccus laccus*—H. T. H.], a variety of Coccus insect found upon oak trees about the Mediterranean. The normal colour produced from it is a rich carmine. It is one of the oldest Oriental dyes, but it has been supplanted, in a measure, by the Mexican Cochineal, which, after the conquest of Mexico, and the importation of its product into Spain and thence into the Orient, took its place as an Eastern dye. This is used for the most flaming reds, as well as in combination with other materials to give quality to tamer shades. It is more brilliant than the native kermes, but, the Eastern dyers say, not so permanent. With the old vegetable mordants, it produces a comparatively fast dye. In dilution with madder it provides scarlet, cherry, and various degrees of pink. There is a mineral kermes, an artificial sulphite of mercury [said to give shades of great beauty, but to kill the wool in a short time—H. T. H.], which borrowed its name to fit its brilliant colour, and is not to be confounded with the insect dye. In recent years, many reds have had for basis the dye-woods—Campeche wood, Brazil wood and others—which have been engrafted upon the Oriental system. Rich pink shades are often had from the rochella or orchil, a lichen which grows on the rocks around the Eastern seas. [Possibly to be found on the Indian coasts—H. T. H.] Singular reds are also obtained from onion skins, ivy berries, beets, and a multitude of other plants, of which only the dyer knows the secrets.

"All the complexities of his craft this accomplished artizan carries in his head. He keeps no tell-tale book of recipes. In a frame in the outer room are displayed the different tints of which he is master. The number of them is bewildering. It is not unusual for *al boyaji*—the dyer of red—to be skilled in some hundreds of shades of red, any one of which he can set about compounding at a moment's notice, without thought of reference to any aids or authorities.

"The great majority of Eastern blues have for a basis indigo, which for the hundreds of shades used is compounded with almost every other dyeing material known in the Orient. In Persia, dyeing with indigo is accounted as high an art as is the science of reds in Turkey and Bokhara. [The magnificent old Persian blues, said to have been taken from one source for both textile dyeing and enamel work, have apparently been lost for ever—H. T. H.]

"The principal yellows are obtained from Persian berries, which although they are indigenous to Asia Minor, attain a greater size and a more pronounced yellow colour in Persia, from turmeric, and from saffron and sumac roots. The turmeric yellow is not of itself a thoroughly fast colour, but imparts a life to other shades when used in combination. It serves as a mordant for certain dyes, and owing to its instant change to brown, when brought into contact with any alkaline substance, is used in chemistry as a test for alkalis. Some yellow shades are produced also by combination of the wood dyes, and saffron roots and flowers, and a variety of ochra plant.

"Indigo, in combination with the yellows, furnishes most of the greens used by the old native dyers. With the buckthorn, or *Rhamnus*, it produces the Chinese green, and with turmeric and the Persian berries, a wide range of intermediate greens, both bright and dull.

"The deepest shades of brown are obtained by dyeing with madder over indigo, as the deep Persian blue is secured from applying indigo over pure madder—wood brown and camels' hair brown result from the use of madder with the yellows. In Anatolia, this has been accomplished lately by use of the * orange aniline colours. Gallnuts also enter largely into the making of the browns.

"The densest blacks, which are little used except for outlining patterns, and defining border stripes, are made chiefly from iron filings, with vinegar and rind of pomegranate, and sometimes with the addition of Campeche wood. Grey shades are secured by the use of Smyrna gallnuts.

"The schedule of purples is one of the richest in the whole realm of Eastern dyes. The different red ingredients mentioned above are used in combination with indigo, and the dye woods and the *Rochella tinctoria* play a large part. The thoroughness with which the Oriental dyers have canvassed the whole field of substances to discover a new material for establishing or modifying colours is shown in the combination for a popular shade of violet. It starts with a mixture of milk and water, in exact proportions, then madder is added in certain dilution, and lastly, the whole is converted by sour grape juice. A great many shades of purple, heliotrope, lavender and the like are secured from the bodies of marine insects and molluscs.

"This outline will serve to indicate the honesty which dominates the old Oriental colouring. It can only suggest the great variety of materials employed, and the consummate skill required in the blending. Vine leaves, mulberry leaves, myrobalans, laurel and angelica berries, artichokes, thistles, capers, ivy and myrtle—all things that grow within the ken of the dyer—have been tried to their utmost as possible colour-makers and colour-changers. Many of the growths are cultivated by the dyers upon their small acreage, in the intervals of their momentous labour in the shops."

S. G. W. Benjamin, in his 'Persia and the Persians,' says—"It seems strange that processes should be lost for producing articles, by a people who actually continue to manufacture without interruption the very objects into which these processes enter . . . . There never has been a time, for ages, when the Persians have not been manufacturing rugs, during all which period they have been manufacturing their own dyes; and yet, within forty or fifty years, the secret of making the superb blue colour which distinguishes the finest examples of old Persian tiles, illuminated manuscripts and rugs, has fallen into disuse, and no one seems now able to reproduce it."

* The beautiful brownish orange dye of the Bangalore Central Jail, is produced from a combination of indigenous and chrome-alizarine dyes.—H. T. H.]

Some Dye Plants and Vegetable Drugs.

No.	English name.	Botanical name.	Vernacular name.	Dye Properties.
1	Bastard teak	Butea frondosa	Hind. Tasu or dhak flower. Tam. Palasan or murukkan. Tel. Moduga. Can. Muttuge.	Yellow to reddish orange, got from flowers only. Often used with other drugs, as catechu and lodh.
2	Turmeric	Curcuma longa	Hind. Haldi ... ... Tam. Manjal. Tel. Pasupu. Can. Arisana.	Dried rhizomes. Gives a golden yellow, or red to brown with alkali. The hardest and firmest rhizomes should be selected for dyeing.
3	Pomegranate rind ...	Punica Granatum ...	Hind. Náspál ... ... Tam. Madalai. Tel. Dalimba. Can. Dalimbe.	The rind of the fruit is generally used as a mordant; has some yellow colouring matter; contains much tannin; much used as a colour concentrator, and in fixing many dyes.
4	Indigo	Indigofera tinctoria ...	Hind. Nil ... ... Tam. Avari. Tel. Aviri or Nili. Can. Nili.	Very largely used in dyeing, gives fine blues, and when mixed with other drugs, many other colours. Colour obtained by a fermentation process from the whole green plant.
5	A'l root	Morinda citrifolia ...	Hind. A'l ... ... Tam. Nuná or manja pavattai. Tel. Maddhi. Can. Maddhi.	Dried root. Gives a good deep dull red colour; mordanted with alum. Might be more frequently used in wool dyeing.
6	Indian madder ...	Rubia cordifolia ...	Hind. Manjith ... Tam. Manjishtai. Tel. Sirinjivéru. Can. Manjista.	Colour from root and small twigs. Colouring principle is purpurin and munjistin. Is fairly well mordanted with all alkalis and alum; is an excellent crimson. Gives a fine scarlet and glowing crimsons with tin mordants.
7	Safflower	Carthamus tinctorius ...	Hind. Kusum ... ... Tam. Kusumba. Tel. Agnisikha or kusumba. Can. Kusumba.	Contains two colouring principles, red, which is the base colouring of the flower (carthamin), and the other an unnamed yellow substance, which is removable by washing the bruised flower in water. The red is dissolved in alkalis, and precipitated by acids. Rarely used for wool dyeing, not very fast.
8	Sappan, sappan wood...	Cæsalpinia Sappan ...	Hind. Bakkam. Tam. Varathangi. Tel. do. or bakamu. Can. Pathangee.	The wood, in chips or powdered, is boiled in water. Mordant alum, with often turmeric or lodh, colour a good dull red, is used with other drugs for various colours, frequently with lac or madder.
9	Red cedar	Cedrela Toona	Hind. Tun .. ... Tam. Tunu or sendanavembu. Tel. Nandi. Can. Noge or devadari.	Flowers give a good yellow, fairly fast. Often mixed with turmeric. Vegetable acid, alum or lime are added to the decoction, and give greater permanence to the colour.
10	Catechu	Acacia Catechu	Hind. Kattha ... ... Tam. Kasukatti. Tel. Kachu or kancha. Can. Cutch or kachu.	Colour got by boiling the soft wood. The commercial extract is sometimes used in India. Lime and nitrate of iron are good mordants. Gives good brown shades. Is itself a mordant.
11	Myrobolan, gallnuts.	Terminalia Chebula ...	Hind. Hana ... ... Tam. Kaddukai. Tel. Karakai. Can. Alalè or hirada.	Rind of the nut is used for dyeing, is a fairly good mordant (whole nut) crushed. Gives brown with catechu, yellow with alum, grey and black with iron sulphate, and soft dull greens with turmeric and indigo. Used in dyeing with Indian madder and sappan wood.
12	.....	Phyllanthus Emblica ...	Hind. Doula ... ... Tam. Nelli. Tel. Usirika. Can. Nelli.	Often used as a mordant. Gives a fairly good black with sulphate of iron.
13	Lodh	Symplocos racemosa ...	Hind. Lodh	A good mordant for many dye drugs, specially lac, turmeric, and Butea frondosa. Is usually supported by other alkalis.
14	Jack tree	Artocarpus integrifolia ...	Hind. Jak .. ... Tam. Pela. Tel. Panasa. Can. Halasu.	The sawdust gives a fairly good yellow dye in strong infusion. Is mordanted with alum, Symplocos racemosa, or milk hedge.

Some Dye Plants and Vegetable Drugs—continued.

No.	English name.	Botanical name.	Vernacular name.	Dye Properties.
15	Blackwood, or Indian rose wood.	Dalbergia latifolia ...	Hind. Kala sisham ... Tam. Iti. Tel. Irugudu. Can. Bitti.	The sawdust gives a good brown dye. Treatment as for jack tree sawdust.
16	Padauk	Pterocarpus indicus ...	.....	Sawdust, with alum, Symplocos racemosa, and milk hedge ashes, give a fast dull yellow to reddish brown dye.
17	Milk hedge	Euphorbia Tirucalli ...	Tam. Tirukukalli ... Tel. Bontakalli. Can. Do.	Ashes are frequently used as a mild mordant. Chay root was always mordanted with it.
18	.....	Ventilago Madraspatana.	Tam. Puplay Chukkay ... Tel. Suratichekka. Can. Paplichekke.	Root bark, with chay root, gives fine purple-brown and chocolate dyes. With myrobolam is said to give a good non-iron black. Except for black, dye paler than is needed. The mordanting with alum and myrabolam always darkens the colour.
19	Cassia	Cassia integrifolia, or Tora.	Tam. Usiththagarai ...	Gives a weak but fairly fast yellow, boiled with alum, or alum and Symplocos racemosa. Several dippings and dryings are needed.
20	*Lac, lac dye, butti lac.	Coccus lacca	Hind. Lac, Lakh ... Tam. Kombu arakku. Tel. Lukka. Can. Aragu.	A minute insect which lives on the twigs of trees. Especially on Ficus religiosa *(pipal)* and Zizyphus Jujuba (ber). Once established on a tree, the smaller branches and twigs soon became covered with them. These are cut off and exposed to the sun to kill and dry the insects. The colour is produced and precipitated by washing. It is then evaporated, and, after the shellac of commerce has been removed the colour is laid on cloths, and dried in shade. When partly dry it is cut into squares and becomes "Butti lac." Gives a most valuable crimson and many other colours. With tin rivals the scarlet of cochineal.
21	Cochineal	Coccus cacti	Hind. Kirminj ... ... Tam. Tel. } Kirimanji. Can.	Is the female of the insect found on certain kinds of cactus in Mexico and Guatemala. Gives a magnificent crimson colour and a fine scarlet. Believed by South Indian dyers to be a seed or grain. Attempts have been made to acclimatize it in Southern India without success. The colouring matter is carmionic acid. Often used for silk carpets, rarely for woollen ones, owing to its cost.
22	Chay root	Oldenlandia umbellata ...	Hind. Chirval ... ... Tam. Sayaver. Tel. Chiriveru.	This is a common weed growing in sandy soil, and the uncultivated plant is said to be the best. Holder, in his 'Dyes and Dyeing in Madras,' says "The root is dried and powdered, resembling snuff. Mixed with water it gives a golden yellow colour. The addition of a little lime on milk-hedge ash turns this into a fine clear red. I am told that, before the introduction of aniline colours on the East Coast, chay root was extensively used for cotton-dyeing, and gave several very beautiful reds." Slater 'Manual of Colours and Dye-wares' says:—"Sooramjee.—A plant growing in India known to botanists under the name *of Morinda citrifolia.* In its native country, it has long been employed as a dye-ware yielding colours analogous to madder." And again, "Chayavra, a plant of the madder family capable of dyeing similar colours." Chay root is still used by cotton dyers, where they want a permanent crimson, rose red or pink colour. Gives good reds, which are rather dull unless mordanted with tin. Was used for reds in wool dyeing, its re-introduction should be encouraged.

* The best Butti Lac is procurable from Messrs. Jardine Skinner & Co., Kilburn & Co., and Carapiet & Co., of Mirzapur, U.P., and from Messrs. Angelo Brothers of Calcutta. Price varies with the market from Rs. 4 to 10 per India maund of 82⅔ lb.

Some Dye Plants and Vegetable Drugs—concluded.

No.	English name.	Botanical name	Vernacular name.	Remarks.
23	Kamela powder ...	Mallotus philippinensis..	Hind. Kamela ... ... Tam. Kapila podi. Tel. Kapila. Can. Kurku.	A large tree. The powder falls off the capsules, and is collected on lime strewn under the trees. The colour is got from a glandular pubescence from the exterior of the fruit; a reddish powder. This is mixed with oil into a paste, and is then dissolved by water containing lime and a vegetable alkali. The colour ranges from gold to orange. It has rarely been used for wool dyeing.
24	Mango	Mangifera indica ...	Hind. Am ... ... Tam. Mam-marum. Tel. Mamidi. Can. Amba, or Mavina mara.	The fresh and dried unripe fruit are often used as acid mordants in dyeing processes. Is also a colour intensifier. Bark and leaves yield a yellow dye.
25	Tamarind	Tamarindicus indica ...	Hind. Imli, imbli ... Tam. Puliyan. Tel. Chintha. Can. Hunise.	Fresh and dried fruit used as a vegetable acid and as acid mordant in dyeing.
26	Lime or lemon ...	Citrus acidtia and Citrus medica.	Hind. Limbú, nímbu ... Tam. Elemichumpullum. Tel. Nimmapandu. Can. Nimbe-hannu.	The fruit is frequently used as a vegetable acid, as a colour intensifier and as a mordant.
27	Red sanders wood ...	Pterocarpus santalinus ...	Hind. Sandal surkh, lal chunden. Tam. Shen-chandanum. Tel. Erragandhapu-chekka. Can. Kempugandha-cheke.	Chips of the wood boiled with wool or cotton give an excellent red dye. Is often used with other fast red dye drugs as a first or second dyeing. Also as a base dye for orange, etc. Mordants with vegetable alkalis. Brightens with vegetable acids.
28	Indian Gamboge ...	Garcinia Morella ...	Hind. Gótághanbd ... Tam. Iréval-chinip-pál. Tel. Rival-chini-pal. Can. Lamál.	Tree exudes a bright yellow liquid, which dried in shade is the gum gamboge of commerce, said to give a fairly fast yellow dye if mordanted with alum and milk-hedge ash.
29	.....	Calysaccion longifolium...	Hind. Surunj. ...	A large tree, bark and root give up a good red dye, said to be best mordanted with myrabolam and alum in separate baths, Grislea tomentosa flowers are often used with this dye. Gives a full rich crimson, quite fast. Is much used in Central India and Bombay for silk dyeing.
30	Henna	Lawsonia inermis ...	Hind. Mehndi ... Tam. Marudani. Tel. Gorantá-chettu.	Leaves give a reddish brown and a dull red dye. Mordants are catechu with pomegranate rind or alum.
31	.....	Grislea tomentosa ...	Hind. dha-ke-phul ...	Flowers astringent, contain a good deal of tannin. Said to give a good and fast red colour.
32	Casuarina	Casuarina equisetifolia and Casuarina muricata.	Hind. Sarrosh-phar ... Tam. Chouk maram. Tel. Sarva-chettu.	Bark is astringent and resinous. Gives light reddish-drab, which is good, but somewhat lacking in depth. Sometimes used as a mordant.
33	Tamarisk	Tamarix gallica and Tamarix indica.	Hind. Main	Grows in sandy beds of rivers and on the coast. The irregular tuberculate galls, which occur on the branchlets are a good mordant.
34	Soap-nut	Sapindus trifoliatus ...	Hind. Ritha ... ... Tam. Ponnang Kottai Tel. Kumkudu chettu or Kugiti Kaya. Can. Kudale-kayé. Urvanjik-kaya.	Fruit is an excellent detergent. Frequently used for finally washing wool before dyeing it in soft and delicate shades, often gives the wool a silky gloss.
35	Soap-pods	Acacia Concinna ...	Tam. Siyakkai ... ... Tel. Sikaya. Can. Sigekayi.	Pods are a very good detergent, often used for final cleansing of wool.
36	.....	Avicenna tomentos ...	.....	Ashes are used as a mordant, and also as a detergent.
37	Bulb-bearing yam ...	Dioscorea bulbifera ...	Hind. Tamin Kand ... Tam. Vettilaivallikkizhangu. Tel. Chedupaddu dumpa.	A very good detergent for wool, has much of the effect of soap nut. Should be more used.
38	.....	Nyctanthes Arbor-tristis.	Hind. Harsinghar ... Tam. Parijatapu. Tel. Paghada. Can. Hansing.	Flower tubes often used with flowers of Cedrela toona, turmeric, or indigo. Mordanted with alum, or lime juice.

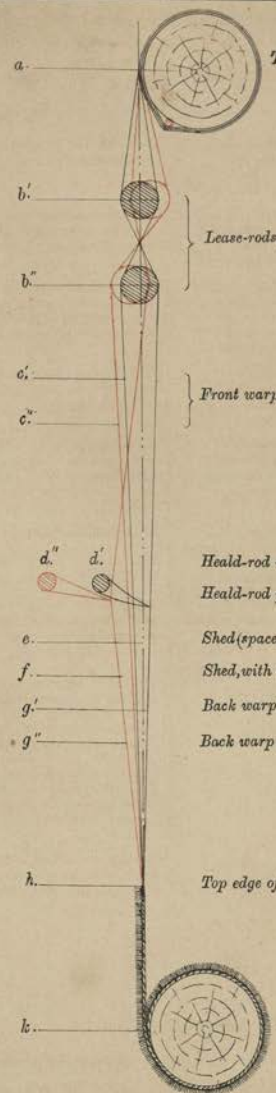
Some Mineral Dye Drugs.

No.	English name.	Scientific name.	Vernacular name.	Remarks.
1	Sulphate of iron ...	$FeSo_4$	Hind. Heera Kasis ... Tam. Anna bedi. Tel. Do. Can. Do.	Used with other dye stuffs it gives black, dark grey, and occasionally violet. A mordant.
2	Crude carbonate or sulphate of soda.	$NaCo_3$.	Hind. Reh ... ... Tam. Aplakharum. Tel. Do. Can. Aplakara.	The efflorescent salt found on sour land (usar), used for washing wool, and to dissolve a colour by alkaline action.
3	Sajji. Mixed impure carbonate of soda and potash.	$NaCO_3$, with some earth, and a little K_2Co_3 as impurities.	Hind. Sajji ... ... Tam. Mara uppu or sambal uppu. Tel. Buddi uppu. Can. Mara uppu.	Produced by the burning of strongly alkaline plants, adding them to a strong solution of reh, and drying the mixture by exposure to the sun. Used in dyeing and wool and cotton scouring and bleaching.
4	Lime	Ko	Hind. Chunam ... Tam. Sunnambu. Tel. Sunnam. Can. Sunna.	Used in dyeing and bleaching, also in scouring wool, especially that from dead sheep; hence called "*chunam*" wool.
5	Alum. Sulphate of potassium and aluminium.	.....	Hind. Phitikari ... Tam. Padikharam. Tel. Do. Can. Patikara.	Largely used in dyeing. The most valuable of all mordants. For many dye processes it is well to give the wool a steep in a weak hot alum solution, and dry in the sun before entering to the colour bath.
6	Blue vitriol	Sulphate of copper ...	Hind. Tutya ... ... Tam. Thuththam thurisi. Tel. Mailthuththi. Can. Mailthuththo.	Gives with lime a light blue colour.
7	Sulphuric acid ...	H_2SO_4.	Hind. Tezab ... ... Tam. Gandagadravakam. Tel. Do. Can. Do.	Largely used in dyeing. Sulphindolic acid is made by dissolving powdered indigo in it, in the proportion of 3 to 1 of indigo.
8	Tin, Tin spirit, or Dyer's spirit.	Stannum	.....	All the tin mordants are of great value in the dyeing of scarlets, crimsons and other lake (lac) colours generally. A form of tin spirit in common use is thus made. Aquafortis duplex 8 parts, salammoniac 1 part, dissolve. Now add very gradually grain tin 1 part; when dissolved close the jar so as to seal the solution from the air. Sometimes equal parts of aquafortis and muriatic acid are used in the above formula, giving "Plum spirit" or "Red spirit."
9	Nitromuriate of tin ...	.....	.....	
10	Protochloride of tin ...	.....	... ..	
11	Muriate of tin ...	.....	.....	
12	Sulphur	S	.....	With carbonate of soda, a little turmeric, and potash, flowers of sulphur give an excellent and fast yellow dye. Used also for wool bleaching.

LOOMS, WARPING, WEAVING, Etc.

There does not appear to be any necessity for going deeply into the fullest details connected with the looms, warping and weaving, etc., the processes are of the simplest, yet nothing but experience can practise them properly. I content myself therefore with the following brief note and diagram.

The loom is most simply and cheaply made from two heavy upright wooden, stone or masonry posts, pillars, or pairs of rails, with a pair of holes or sockets in each, in which



SECTIONAL ELEVATION OF A CARPET LOOM, ILLUSTRATING THE MOVEMENT OF LEASE-RODS AND HEALDS.

Adopted from 'Monograph on the Woollen Fabrics of the Bombay Presidency'—1899 B. A. Brenton, I. C. S.

the two loom beams, which they carry, can revolve. The warp [Tam. *pavu*, Tel. *padugu*] of cotton [usually "spun up" mill yarn from 5*s* to 20*s*] plain or coloured, hemp or jute twine [of a thickness which is usually proportionate to the quality of the carpet to be woven] is made in a most simple way, without anything like a warping apparatus. Two long iron or wooden stakes are firmly driven into the ground at a proper distance apart, and the weaver walks round and round these, laying the thread evenly over each as he passes, and maintaining a regular tension. The warp is crossed in the centre, so that it forms a figure of eight on the stakes. While the warp is being "laid" on the stakes, another worker "laces in" a cord through it, and on the outer side of each of the two stakes, and sees that each wind is of equal length, otherwise equal tension cannot be got. The warp is now carefully slipped off the stakes on to two iron rods or bamboos, and these are either hooked into hooks in slots, cut in the lower roller beam, or lashed into them. The top end of the warp is then set on to the upper roller beam. If the warp is even, there will be no slack threads found when the warp is tautened by turning the rollers. One often sees the yarn tautened in places by slips of wood or wedges, but, if the warping and healding are done properly, this is unnecessary. The yarn is rolled on to the upper beam until it has stretched, and it is kept on tension for a day to allow of further stretching before weaving begins. In North India the warp is usually stretched on pairs of stout iron rods or pipes—wherever the width of the carpet admits of their use—equal tension being given by chains on double ended screw couplers. The old-fashioned metre gauge railway wagon couplings are much in evidence in the factories of Amritsar, where they are also used for loom tension.

Winding of the carpet as weaving progresses, and tension to the warp, are thus provided for. At one end of the loom each beam has two, sometimes four, holes in it, stout iron or wooden bars are inserted into these, one into each loom beam or roller. After getting the warp as taut as possible by hand, a chain is hooked on to the bars, and tension is given by a double shackled screw coupling [*pench*] which is hooked into a convenient place toward the lower end of the chain. The chain and screw coupler are very often replaced by stout ropes, the twisting of which gives and maintains the necessary tension.

The mechanical part of the weaving of a carpet may be thus described. After the warp has been mounted on the loom beams, the two "healds" [Tam. *vilathu*, Tel. *vadi*] are attached. It often happens that only one heald is used; the second is not an absolute necessity. The bazaar carpet weaver almost always does without it, and works with the heald on the back row of the warp. An advantage of the second heald is the increased "shed", or space between the two rows of warp, which it gives. The heald rods [Tam. *vizhuthu kol*, Tel. *atsu kol*], are laced by loops [healds], one set to the back row of warp threads, the other to the forward one. Both rods are so connected that the forward movement of one relaxes the other, and *vice versa*.

One of the "lease rods" [Tam. *alagu*, Tel. *laika*] is now passed between the two lines of warp, and near the upper loom beam. The healds having been reversed, thus crossing the warp, the second lease rod is put into position below the upper one, and is kept from falling by a pair of loops, one at each end of the pair of rods. In many cases single and not double "leasing" is made, by the use of one lease rod only.

The purpose of the lease rods is to keep up equal tension on the front and back row of warp when the heald is being reversed, and after each row of weaving is completed.

We have seen that the forward movement of the back warp threads, acted on by the heald, causes the lease rods to travel in opposite directions, straightening and shortening the warps between the under or [only], lease rod, and the point whence they leave the lower

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loom beam, therefore lengthening them between the working edge of the carpet and the lease rod. The heald, being reversed, now drags them into position. The tension on the front threads is also increased by the forward movement of the heald, so that a quite even warp tension is thus ingeniously secured.

The shed [Hind. *chhed*, Tam. *puni*, Tel. *ani*] is the space which a free heald gives between the front and back rows of warps. It is through this space that the woof yarns are passed.

The weavers sit in front of the loom, each one being usually responsible for from 18 to 30 inches of width of carpet. Each weaver has balls of yarn, of the colours to be used in the carpet, hanging above him, within easy reach. One of the weavers, or, in the case of a large carpet, a "reader" sitting at the back, calls off the stitches, or reads the pattern from a section paper, drawing, diagram, or a sample carpet.

Fifteen or twenty rows of weft are first woven on plain, without pile, and well beaten down. This is done to ensure the end of the carpet holding well together, and that the warp threads may keep their relative distances. The finishing off of a carpet on the loom is done in the same way.

The woollen yarn is held in the left hand, and a curved knife in the right. The warp is then taken hold of, the yarn twisted round it, and crossed on itself, and the knot so made is cut off with the curved knife, when a row of knots across the whole width of the carpet has been completed. The weft threads (cotton, hemp, or jute) are then passed between the two rows of yarn, and beaten down with a bent iron-toothed comb, in shape somewhat like a carpenter's adze. The heald rod [Tam. *vizhuthu kol*, Tel. *atsu kol*] is then reversed, the warp thus locking in the row of knots of pile. The row of pile is then clipped with a pair of villainous looking country-made scissors, and so the process goes on to the end. Boys can weave quicker than men, especially where small fingers are needed to pass between the warps of fine count carpets. The length to which the pile is cut depends on the will of the weaver, and the class of carpet to be made.

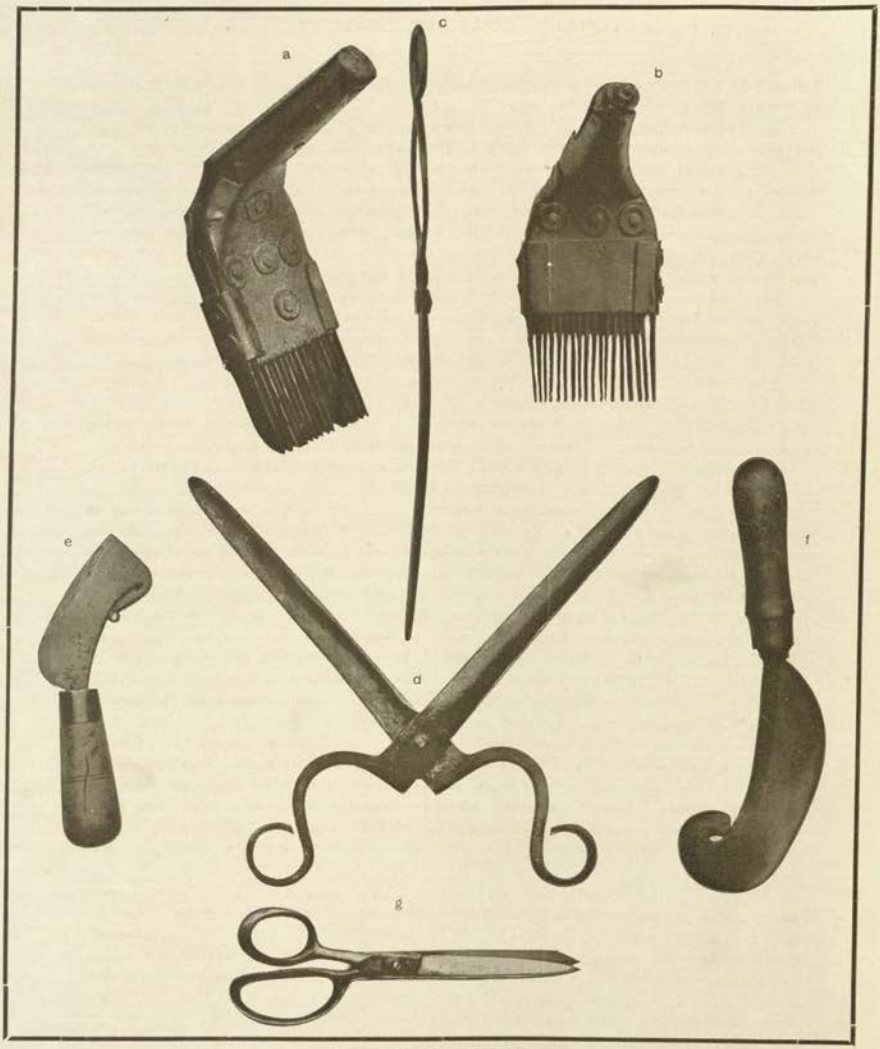
Expert weavers rarely weave in, at once, a whole row of stitches across the loom, and this especially when, in, as is often the case, a design with small and frequent repeats, or which they are often making, or when they have learnt the pattern by heart. They work in all the stitches of one colour in the row, go on to the next, and so on, until they have put in all the colour except the ground, which is worked in last.

In carelessly woven carpets one often sees the warp strands shewing at the back as white spots between the rows of pile knots, these are known as "suet" or "fat spots" [*cherbi*]. A well woven carpet has the weft [*bana* or *buktas*] always running through it in sets of two stout lines; one passed in from each side, so that a pair of them is locked in above and below each row of knots.

Badly made carpets have often three, four or more lines of woof to every line of pile knots [*pech* or *gant*]. This is altogether unnecessary, and it separates the lines of pile, but it gives cheap bulk and weight to the carpet, cotton or hemp being much less costly than dyed woollen yarn. The woof is generally dyed deep blue.

Some other faults in weaving are, knotting the stitches on to two strands of the warp instead of to one [*jhuta bunai*]: in cheap coarse carpets this is oftener the rule than the exception, and in many good grade carpets main and border ground filling, and other large masses of one colour, are worked in this improper way. The weft is sometimes passed from one side only. And occasionally two or three rows of pile are worked in with only a line of weft above and below them.

One often finds carpets which do not lie flat; this is due to the woof threads having been drawn too tight. Irregular beating with the comb is another bad fault, it is easily



CARPET WEAVER'S TOOLS.

a. b.—The *Kangi* (*shyana*) or comb, used for beating down the wool and pile knots. Fineness of the teeth varies with the count of carpet to be woven.

c.d.—The *Miqraz* (*kainchi*), or scissors, for shearing evenly the pile ends which form the "velvet".

e. f.—The *Knife* (*chhuri*), used for cutting off the yarn after the knot of woollen yarn has been tied.

g.—A form of scissors often used in Ireland for hand loom carpet work.

traceable by the backing looking uneven. Carpets that have been slackly and unevenly beaten soon shed their pile.

The looms are usually built in long pits about eighteen inches deep, sometimes of masonry, but often only excavated, and the earth at the sides, top, and bottom, kept firm and clean by constant cow-dung plastering. The weavers sit on the edge of this pit, which catches all wool cuttings, etc., and the under loom beam, or roller carrying the finished work, is consequently almost at ground level. An objection to this is that rainy weather often appears to communicate damp to the carpets, which certainly does not improve them. The frequent Persian practice of having the lower roller well above floor level, and seating the workmen on broad benches, is probably the best.

The very simple tools of the weaver are illustrated in plate No. I, facing the title page, and need no comment. They are of the crudest description, forged by village smiths. Weavers will rarely use English scissors, their good old conservative objection being—"We know our 'desi' scissors, others are strange to us."

The different forms of "knots" in use in carpet-weaving may be seen at a glance on plate No. II and require no explanation.

The fineness of a carpet can always be tested by turning it on its face, and counting on the back the number of stitches in a square or linear inch, or by counting the pairs of warp strands on the fringe at the end. The qualities usually made are, 4 stitches each way = 16 to the square inch, 4 stitches in length by 5 in breadth = 20 stitches to the square inch, 6 in length and 6 in breadth = 36. Up to this count carpets may be called coarse. 7 by 7 = 49, 7 by 8 = 56, and 8 by 8 equalling 64 stitches, comprise medium grade carpets. The 8 by 8 count being, if properly made, a really sound, handsome and useful carpet, it ought to show little or none of the warp or weft at the back, which should look almost as clean as the face of good Berlin wool work. Few carpets finer than 8 by 8 stitch appear to be made in this Presidency, except in the Central Jails, the Madras Anjuman Workshops, and the School of Arts, Madras. High grade carpets comprise 9 by 9 stitch, occasionally 9 by 10, 10 by 10, 12 by 12, and up to 16 by 16, or 256 stitches to the square inch. Wool spun suitably for carpets finer than this is not easily procurable in South India, and it is also necessary for the weaving of these fine "counts," that the wool be soft and fine.

It is unfortunate that so many carpets made in South India are woven of "chunam", "limed" or dead wool, *i.e.*, wool taken from dead sheep, or obtained from butchers' fleeces. Almost all the cheap export rugs made in the Madras Presidency are made from this wool. It is harsh, brittle, and rarely takes up colour properly. It is also used mixed with "live" wool. A great objection to the use of chunam wool is that in damp weather it gives off a distinctly offensive smell, and this for years after the carpet has been made.

Of weaving, J. K. Mumford, in his 'Oriental Rugs,' says that it is "the patient, painstaking labour at which so many hundreds of thousands of swarthy fingers are flying, and have been flying ever since the days of the Pharaohs. Measured by results it is a wonder work; watched, in its tireless repetition of three simple processes that a child can master, it seems no more of an art than the constant turning of an hour-glass—which, in fact, to myriads of these Eastern people, it is. The whole thing is simple, to look at, to read about; but there is nevertheless, some peculiar spirit, some mental drift, some inherent and mysterious fitness pervading, and governing their work, which makes these Orientals the best weavers in the world. Peoples of other races have reared looms, and dyed yarn, and, borrowing the tricks of colour and of stitch from Turkey and Persia, have striven to work out upon the warp a harmony as rich and full as theirs. But they have failed.

"For it is not to be disputed that there is some faculty which to this day enables the Orient to excel the West in hand-wrought fabrics, even with uncouth appliances such as that same West has long ago outgrown.

"Any lad with a knack for carpentry can make such a loom as that upon which the Eastern does his weaving. Plain, absurdly primitive, it endures for a lifetime, or many lifetimes, and its timbers are often adorned with carvings done by hands long since still. It is in essential principles the same old-fashioned structure that is pictured on archaic tiles and vases; the same that we know to have been used for thousands of years in the weaving of coarse cloth and canvas. The method, too, is the same in its rudiments, with the addition that instead of throwing the weft across the warp compactly, to make a thin, firm web, the knot upon the warp is employed to form a surface, and the weft becomes merely a binder, holding each row of knots close-pressed to its neighbour. The addition of the pile to the primitive web is believed to have originated with some of the tribes of Central Asia, where severity of weather made warmth a desideratum."

Vambéry tells how the nomad and pastoral races in Asia Minor, Anatolia and Persia still invent for themselves their own modifications of the old patterns, entirely by rule of thumb. The head woman, he says, traces a pattern on the earth, and thus the work of the making of a carpet goes on amongst these peoples, just as it did in old time.

In all the East the carpet industry is almost entirely confined to Muhammadans, but there are still many Christian weavers in Turkey and Persia, mostly Armenians, Copts and heterodox Greeks. They usually work for Christian masters.

It appears to me likely, that the earliest form of weaving was the interlacing of withes, pliant branches, or stout creepers, around poles, other withes, or staves, to form a wattled fence, a mat, or the walls of a wattle and daub house. From wattle work to the weaving of mats out of rushes, or sedge, or of fibre was a quite easy form of transition. Then came the need for some form of clothing, as a protection from the weather, and from venomous insects and reptiles. Following this, the possibility of using the wool or hair of sheep and goats, or wild animals, must have occurred to the minds of the primitive weavers, and thus the production of textiles proper become a regular step in the natural development of mankind.

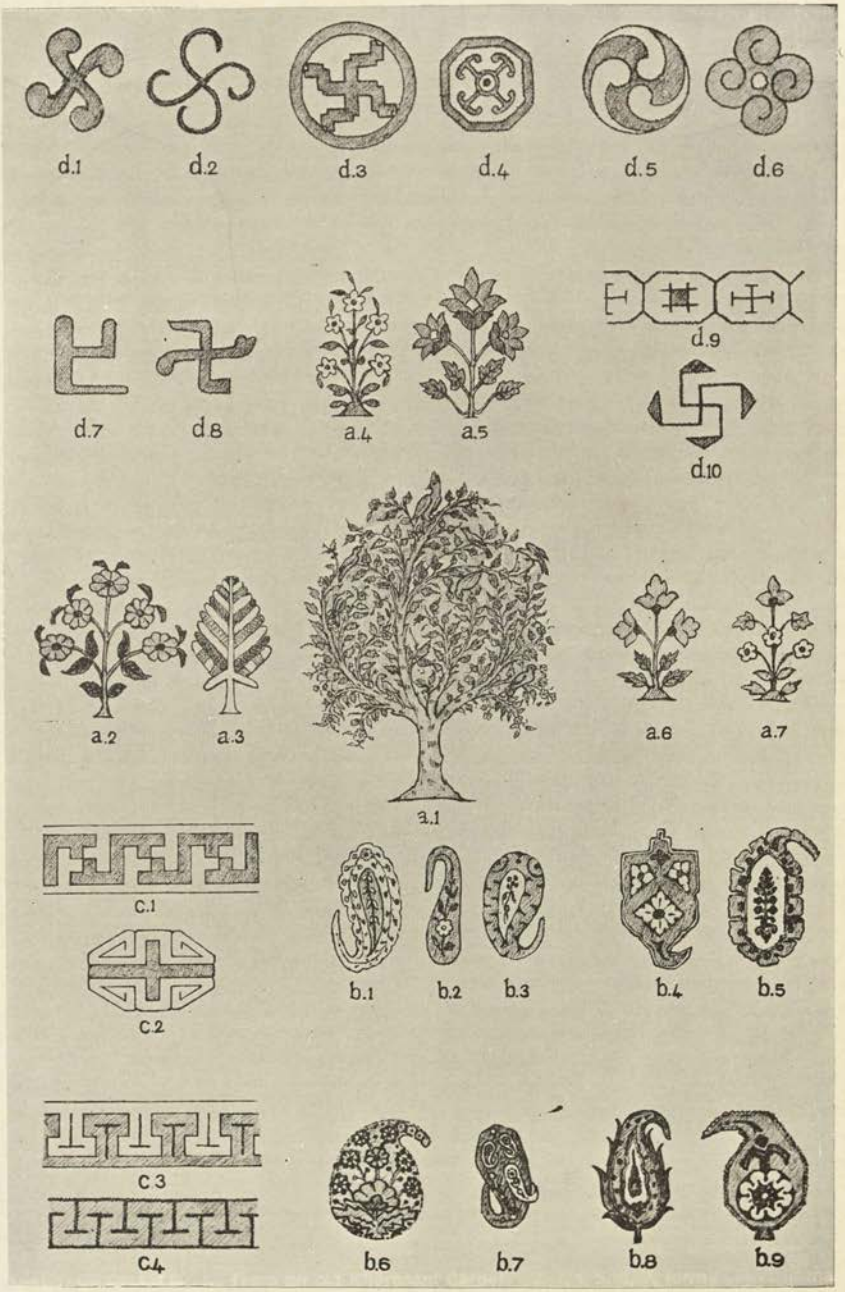
The manual dexterity of the weaver led him in time to seek to decorate his work by introducing some simple patterning into it. He would come to find that certain plants would stain the cloth in attractive colours, and in due course he would get to know how to apply these and make them more or less permanent.

The need for something warmer, doubtless led the weaver to sew tufts of wool or hair on to the cloths be wove, and bye and bye he would have learned to in-weave these, and thus form a pile.

NOTE ON THE SYMBOLISM OF THE ORIENTAL CARPET.

"In a symbol there is concealment and yet revelation, silence and speech acting together, some embodiment and revelation of the infinite, made to blend itself with the finite, to stand visible and, as it were, attainable there."—*Thomas Carlyle.*

Sir George Birdwood says—"A deep and complicate symbolism, originating in Babylonia and possibly India, pervades every denomination of oriental carpet. Thus the carpet itself prefigures space and eternity, and the general pattern or filling, as it is technically termed, the fleeting, finite universe of animated beauty. Every colour used has its significance, and the design, whether mythological or natural, human, bestial or floral, has its



a.—TREES OF LIFE.—1. From an old Khorasani Carpet. 2, 3, 4, 5, 6, 7, forms found primarily in Tabriz and Feraghan rugs, also in South Indian Carpets; 8, a Moghlai form, from an old Ellore Rug.

b.—FORMS OF the cone of flame, mango, pear, palm fruit, serpaitch or river-loop device.

c.—SOME FRETS.—From Indian carpet borders, illustrating the connection between the 'tau' and Greek and Chinese keyed patterns.

d.—SVASTIKAS, FYLFOTS GAMMADIONS., ETC.,—1, 3, 5, Chinese forms; 2, 4, 6, Persian forms; 8, 9, 10, Hindu forms. These are all taken from Indian-made carpets.

hidden meaning. Even the representatives of men hunting wild beasts have their special indications. So have the natural flowers of Persia their symbolism, wherever they are introduced, generally following that of their colours. The very irregularities either in drawing or colouring, to be observed in almost every Oriental carpet, and invariably in Turkoman carpets, are seldom accidental, the usual deliberate intention being to avert the evil eye and insure good luck."

The cause and origin of most of the decoration in Eastern carpets is still largely matter for conjecture. Much of it is hidden away in the gloom of the past. Much has been so overloaded with tradition and folk story as to make it difficult to find out what these forms really meant. All Oriental and specially Persian art (from whence the Indian carpet as it is known to-day undoubtedly came) has taken, converted and crystallized flower, tree, branch, and creeper forms into its own conventionalized realism. Some countries have gone still further, and these conventional forms have become modified into geometrical ones. Owen Jones suggests that Buddhist art and also contemporary Hindu art, date from a time when Greek influence, dominating the Punjàb and Indus and Gangetic countries, and the lands below the Himalayas, spread to Southern India, and that these were preceded by Persian and Assyrian art; and, that, at a later date, Hindu art became saturated with the Muhammadan lotus forms through the Muhammadan conquerors of the seventh century. With all of this opinion we cannot agree, the lotus was from the earliest times a sacred flower, both to Buddhists and to Hindus; it certainly was so long before the dawn of Islam.

We sometimes find the lotus in some old Persian rugs, and often in more modern ones. The "palmette," palm of the hand, pink in profile, or "rosette" probably came from Babylonia through Egypt; the bud, which often, with the foregoing, forms the "knop" and "flower" design (symbolical of bounty and power) is an undoubted lotus form. The "bent lotus bud," "mango," "pear," "pine cone," "serpaitch," or "sacred flame" device, which one so constantly sees in one form or other in Eastern carpets, appears first in Babylonian sculpture. Of all these J. K. Mumford says:—"It is significant that the forms which show indubitable kinship with the lotus are chiefly used in border designs, thus binding and unifying the life story told in the body of the carpet with an unbroken succession of the emblems of eternity and renewed being, the bud signifying birth, the full-blown flower the completeness of age; and the creeper typifying the long repetition of the life process which separates and yet unites the two."

The Tree of Life is another old carpet symbol, illustrating the old tradition running right through Asia and Europe, of a sacred tree shading the faithful in Paradise, and common to all faiths in some form or another. Christianity had it in the "Arbor Perindex,"* "Arbor Vitæ," or tree of faith. It was said to grow in India, a type of the Church, the happy doves in its branches being the faithful, and the serpent trying to entice them away from their healthful rest being "that antient worm the Devil." Often immortal birds rested on it, and flowers of many hues covered it to the almost entire exclusion of leaf. Its antithesis was the Judas tree, traitor's tree, or Arbe de Judée. Sometimes one sees the entire tree in such a form as to be beyond all recognition, but for smaller representations of it within, or amongst the branches of the larger. Central Asian carpets show it stark and stiff as if cut out of metal. One occasionally finds it in form like the seven branched candlesticks of the Hebrew temple, or shaped like the many [usually twelve] branched lamps of Hindu worship. But in Persian art, and in Indian art from the Persian, the tree of life becomes a beautiful flowering plant, with or without a vase, or flower pot or a sprig or spray of simple flowers. Some forms of it suggest the stiff notched and

* I have not been able to get any explanation of this name, which two writers give. Possibly it is a mistake for "*Arbor perfugium*," which was certainly one of the many names of the tree of life.

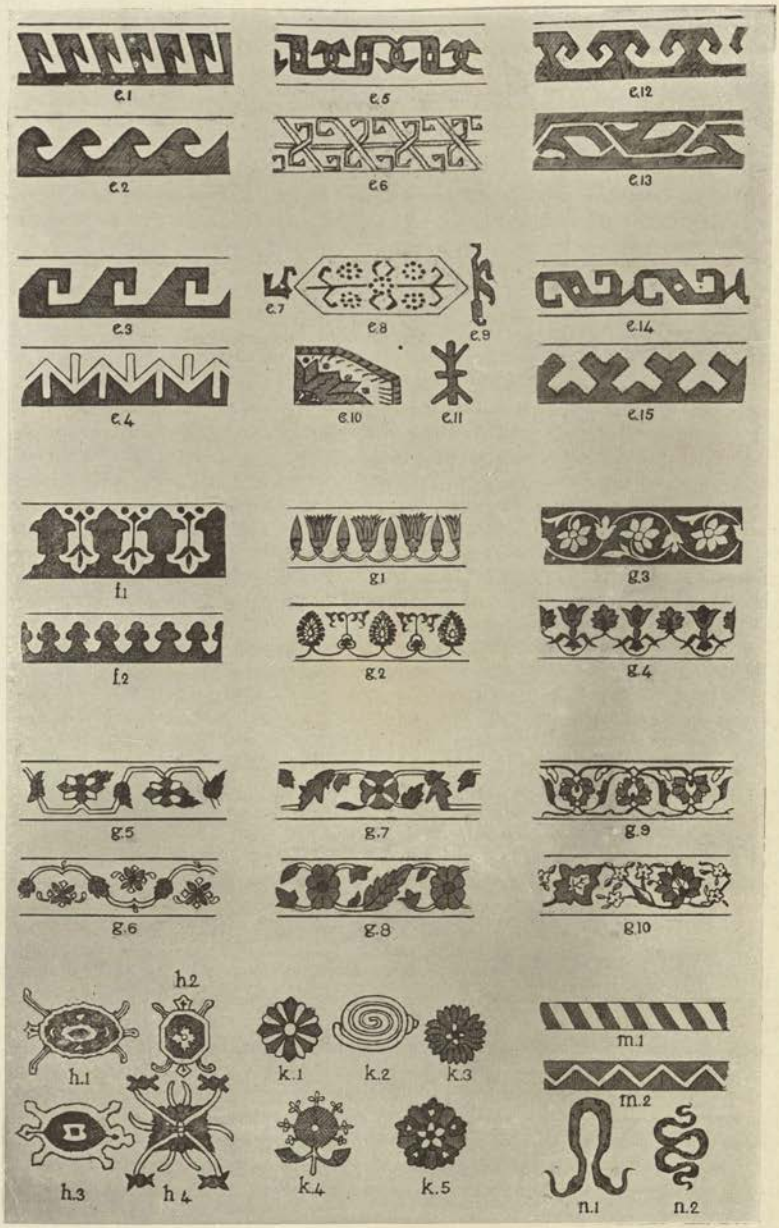
curled wooden tree out of a child's Noah's ark. Others bear huge leaves. This form doubtless represents the Moslem "*Sidrat-ul-mantaha*", "*tauba*", tree of the heavenly mansion of the Archangel Gabriel, or tree of Paradise, with its leaves "like the ears of an elephant, a leaf for every human birth." It sometimes appears in carpets as a cypress, "*Shajarat Allah*" or "*Shajarat-al-djinn.* And sometimes its form suggests the weeping willow, or a flowering or date laden palm. Hinduism has its sacred trees. Sivites have the *Ficus indica*, Vishnuvites the *Ficus religiosa*, and worshippers of Brahma specially recognize the *Butea frondosa. Tulsi*, *Bil*, *Shami*, and *Darlu* are all sacred to one or other of the Dii Majores, as are many other trees. *Ficus religiosa* is the sacred *Bo* tree of the Buddhist faith. And the pomegranate is a sacred tree of life, type of beauty and fecundity.

In the Madras Museum is an old Coromandel hand-painted or printed cloth, decorated with a large tree. This is much in the style of the large trees of life found upon many old carpets. Birdwood in the 'Industrial Arts of India,' 1880—illustrates a very beautiful tree of life on a Masulipatam hand printed and painted chintz purdah. It has fine foliage as its back ground. The branches of the tree are curiously interlaced, birds rest on its branches. As supporters there are two peacocks on either side of the tree and facing it; each holds a snake in his bill. Below the tree are various fishes and turtles, swimming in a quaintly painted sea. I saw, some years ago, a strange old Persian silk rug with many of the characteristics of this cloth.

The "Svastica" probably takes its name from a Thibetan sect of Buddhist rationalists. It is often found in carpets in some one or other of its very many forms. It is often seen in Persian and Indian carpets, frequently in Central Asian ones, and almost every good old Chinese carpet has it somewhere or other in the patterning. It may be taken as symbolising the sun, flame, light, paternity, and also the motion of the earth, health, happiness, and fortune. It is the badge of the seventh "tirthankara" of the Jains, sign of the sun. It appears in most of the rock-sculpture foot prints of Buddha, and in the "wheel of the way" of the Buddhist ritual. Hinduism specially recognizes it as an emblem of Agni and of Indra. It occurs in Pompeii along with the phallus. It may be said of it that, no matter for what purpose it was used, it was always decorative, and, except in its reversed or left handed form, it was ever an auspicious sign.

One often finds, in old carpets, varying forms of the svastica, fylfot, svastic cross or gammadion, also known as the "crux ansata." It sometimes resembles two or more serpents intertwined, and it is, in this form, known as the sun-snakes or "surya-nâg." There is also the "ogee" form of svastica. In this the arms crossing each other at right angles curve off to the right and left, increasing in thickness to the middle of the curve, and finishing in a point. In its three-armed form it occurs on Assyrian coins and, as a minor mark, on those of Alexander, the Great, B.C., 300 to 320. Birdwood claims in the svastica the original of the Greek and Chinese key patterns. One often finds in Central Asian carpets a key border, in which the svastica is easily traced. The "latch hook" with its many variations is doubtless in itself a variant of the svastica.

Closely linked with the svastica is the Tau, T, sacred sign, or sign of life. It is often found in carpets. It appeared in the first "Labarum," or idolatrous standard of the pagans, bearing at once the crescent and the tau cross, the one as emblem of Astarte, queen of heaven, the other indicating Bacchus. In Egypt, it was a token of supreme power, and probably came to be worshipped as the symbol of light and generation, or perhaps feared as the image of death and decay. The scarab—sacred Egyptian beetle—bears, in the sutures on its back and across the thorax, the single T. In the centres of some rugs one often finds a 24 or 28 angled Chinese form of svastica, surrounded by T's or Taus. It



e.—LATCH HOOKS.—These probably first appeared in, and are still common to, carpets made by nomad races in Persia and Central Asia, and they appear in all Indian Carpet Districts; they are apparently divergences from the "fret" and "tau" forms.

f.—TREFOILS.—Frequently seen, usually as minor bordering, in Persian, Moghul, Deccan, and South Indian Carpets.

g.—KNOP AND FLOWER DEVICE.—1, From Nineveh; 2, old Persian; 3, suggests honey-suckle palmette scroll form; 4 to 10 various Indian and Persian forms.

h.—TURTLE AND CRAB FORMS.—Often found in borders of Indian Carpets.

k.—ROSETTES.—1, 3, 5, Common to Indian and Persian Carpets; 2, a whorl from a shell, on an old Ellore Carpet; 4, a Chinese form, often seen in Ellore Carpets.

m.—FORMS OF.—1, The "barber's pole" runner; 2, a "flowing water" runner or edging.

n.—CHINESE CLOUD-BANDS.—Common to China, Turkey, Persian and Indian Carpets.

sometimes occurs as two Taus, or in a triple form. The Tau was also believed to be the "blood mark" on the door posts of the Jewish houses on the first Passover day, and it was to the Jews a symbol of health and safety, of happiness, and of the hope for, and belief in, a future life.

These svastic and tau forms occur all over the world. On the oldest buildings in Europe, on temples, palaces, rock-hewn sculptures in Asia, on the temples of the Incas, in Peru and Mexico, in south and equatorial Africa, everywhere, in short, one finds these familiar crossed, and curved forms, all of which are, in some way or other, connected with religion.

The very old pattern, often called 'the fish,' 'leaf and flower' or 'fish and flower,' and also known as "Feraghan Crescent," "Herati," or "Collector" in the North of India, is, in its varying forms, found wherever Oriental carpets are woven, and each district appears to have its own name for it. It is most common in the form of a rosette or open regular flower, with long curved and usually serrated leaves springing from each side of it. These occasionally are undoubtedly woven as fishes, the eye, mouth and tail being quite distinct, and enclosing a square or an incurving lozenge-shaped device. It generally covers the whole of the ground in a quite small repeating pattern. The fish bulked large in the worship of Isis, and has been long a royal emblem in Oriental countries. The rosette or flower certainly suggests the open lotus flower. If for the rosette and square incurving sides of the Herati pattern, we substitute yellow or white flowers with thin splayed out stalks, we get the "*Gul-i-henna*," or "flowers of henna" pattern.

The sunflower with its characteristic centre, bold big petals and stiff stalks, the vine with its fruit, tendrils and leaves, the ivy and many other flowers and leaves, are found in Oriental carpets. Each has its special symbolism and inner meaning.

The pear, lotus bud, serpaitch, pine cone, mango, *cucus*, *butha*, or cone of flame pattern, is another device which in some form or other appears in the designs of almost every province in which carpets are woven. One finds it as the main decoration of a border. It is often used to cover the whole field; sometime the necks of two or three are elongated, and twined one into the other, and an arrangement of them occasionally forms centre and corner-pieces.

It has been claimed for this form that it originated in Kashmir, illustrating a loop in the windings of the river Jhelum above Srinagar. Some have held it to be a palm fruit, —apparently a rather far-fetched theory. Mumford, quoting the late Shah Nasr-ed-Din's chief interpreter claims that "the device represents the chief ornament of the old Iranian crown, during one of the earliest dynasties; that the jewel was a composite one, of pear shape, and wrought of so many stones that, viewed from different sides, it displayed a great variety of colours." There is no doubt that this very old jewel is one of the most valued possessions of the Shâhs of Persia.

If this explanation be correct, it is easy to understand the depth of sentiment connected with it. It is not to be supposed that the shape was chosen for such perpetuity without some real symbolic or religious reason. Taking into consideration the deep devotion to fire and the sun of the ancient Persians, there is no room to believe otherwise than that this crown-jewel shape represents, in its first meaning, the flame which they worshipped, and which is reverently worshipped to this day by their posterity here in India and in Southern Persia. Here is what appears to me to be very strong support for Sir George Birdwood's contention that this device represents neither more nor less than the cone or flame of fire of the ancient Iranian fire worshippers.

The turtle, crab, and lobster (or cray-fish), frequently appear, especially in borders. They are said to symbolise immortality, possibly on account of the old belief that they lived for centuries. The Serpent indicates craft, subtlety, lust, or desire. The Crescent means

strength and power. One often finds in patterning two or three crescents linked together by a flower or rosette: so arranged they are said to be emblematic of great or increasing strength.

Two triangles joined in the form of an hour glass are emblematical of fire and water. The six-pointed double triangle (seal of Solomon) denotes Divine wisdom. This emblem, if bearing a T or triple tau in its centre, is believed to have been a symbol of recognition of the Divine Omniscience, Omnipotence and Omnipresence. A star with an uneven number of points, usually the pantagon, or blazing star, but occasionally seven-pointed, is a symbol representing "The Great Light," or "Glory of God."

The "Chinese cloud-band," which one often finds in good old-fashioned Indian carpets in old Persian patterns, is a type of the heavenly rest, doubtless originally the *Nirvana* of Buddha. Careless patterning often converts the "cloud-band" into a serpent and *vice versa*, Zigzags or waved lines sometimes denote water, or if sharply angular, lightning. One occasionally finds forms which appear to be combinations, or crosses between the winged globe and the thunder-bolt. The resemblance to both these forms is remote, but little more so than those illustrated in D'Alviella's 'Migration of Symbols.' The winged globe originated in Egypt, and travelled naturally into Persia, and thence to India.

The lamp frequently found hanging from the arch in prayer rugs, and occasionally at each end of the central medallion of a larger carpet, is of course a representation of the lamp of Islam, lamp of faith, or lamp of life. This lamp is most beautifully illustrated in the famous Ardebil carpet, which is in the South Kensington Museum, London.

One often finds a small running border somewhat simulating a bamboo rod with its knots, and this most often perhaps in Turkestan carpets. A similar border exists in some Chinese rugs. It is occasionally seen in Indian rugs and is said to symbolise the power of the law. In carpets made in South India, and occasionally in those made in Persia and Northern India, the "Trisula" appears. The "barber's pole" form of narrow bi-colour or tri-colour border, which is so frequently seen, is said to symbolise the varying lights and shades of human life.

Many of these old forms occur all over the world, and in connection with almost every faith.

Colouring had its own symbolism, and every combination of colours had its own inner meaning, connected often with a flower; white and green represented joy; white alone mourning; yellow, honour and distinction; red and purple, rank and dignity; black and dark-blue, sadness, darkness and trouble.

"Whites, yellows, greens, blues, reds, and black, in cases of the dominant colour of deities and the sacred animals, of the Sun and Moon, were not chosen hap-hazard, but according to the symbolic significance which the Egyptians were accustomed to attribute to each colour—the idea of joy was connected with white and green."—*Brugsch*: 'Mythology.' To the old carpet weaver the magnificent Persian blue, the secret of which seems to have altogether died out, symbolised eternity.

One often sees on carpets one or two small patches of colours not used elsewhere in the patterning, and usually not a part of the pattern; these are worked in to avert the evil eye, to keep off sickness or trouble, or to bring in good luck.

There are an immense number of other forms used in the design of Oriental carpets. Doubtless all of them were symbolic, and each had its own general, and inner or more esoteric meaning. Few, if any, of these other forms ever occur as part of the ornament of carpets made in Southern India, hence I am not dealing with them here.

Illustrations of various forms of the symbols referred to above will be found on plates III and IV.

Carpet weavers consider it a good omen if they find that they have laid an odd number of threads in the warp of a carpet; if the number is even they look on it as indicating much future ill-fortune. The origin of this idea is told in the old legend that the first person who ever laid a warp for carpet weaving was the Devil, but, as he happened to lay an even number of threads, the carpet would not work out right, and he threw the whole thing into the sea in a passion. Lokman, the great astrologer—worker of wonders, and seer of things unseen—next tried, and, as he laid an odd number of threads in the warp, his efforts were crowned with success. He is thus claimed by Muhammadan weavers as the patron of the carpet industry in India. He is said to have got his idea of the weaving from a spider's web, which was sailing down the Ganges on a branch of a floating tree and collided with his boat, just when the story of the Devil's first attempt at weaving was being told to him. Because of this legend, old fashioned weavers often put an extra pair of warp threads into a large carpet.

Some sects of Shiah Muhammadans will not use a prayer rug or carpet unless they have first satisfied themselves that the colour in it is permanent. This is said to be because they fear that prayers said upon it will not be accepted by the Most High. There is no mention of this custom in the Hanafi law.

An old custom, common apparently to all Moslem carpet-weaving peoples, is, that if a visitor to the factory leaves without praising the work on the looms or the carpets in store, he is held to have laid a curse on the work and the master. Fatehas are said, and incense is burnt. If, on the other hand, he expresses his admiration of the work, the master of the house begs him to spit on the carpet being woven, so as to bring good fortune.

THE PATTERNING OF THE CARPET.

"When we approach the study of design, from whatever point of view, and whatsoever our ultimate aim and purpose, we can hardly fail to be impressed with the vast variety and endless complexity of the forms which the term (design) covers, understanding it in its widest and fullest sense."—*Walter Crane*: "The Bases of Design."

Design in textiles naturally divides itself into two main classes—

I. That which is to be woven or knotted into the fabric as a part of the act of weaving, as in carpets, tapestries, brocades, and patterned woven silks, wools and cottons; and

II. That which is planned to form surface decoration and which is to be embroidered, drawn, painted, printed, or otherwise worked upon the fabric; *e.g.*, chintzes, cretonnes, and decorated silks, velvets, etc.

The designing of all textiles coming under the first class, as carpets or tapestries, with which alone we are concerned here, has to be so arranged that the patterns can be worked out in horizontal and vertical lines, and, where the pattern crosses the warp diagonally, in stepped lines. And then only at such angles as the squares, formed by the intersection of warp and woof threads, will admit of. Thus we find that in coarse count carpets, small or sharp curves show a broken outline, and look hard, stiff and unsightly.

The working designs of carpets are generally drawn on section paper, and generally to a scale equalling in fineness the count of the carpet to be woven. Each square represents a knot, or rather the two ends of the pile [see plate II, p. 53]. The diagram is, for convenience of the weaver, usually drawn to the full size of the pattern to be reproduced, and shows either a half, a quarter, or an eighth of the ornament on the carpet. But in the case of an "all over" diaper or repeating pattern, [such for example as the graceful "Herati," or "flowers of Henna" pattern, the fine and simple "Shah Abbas" pattern, the chastely

beautiful "Mian Khani," and the stiff and heavy, yet attractive design, which bears the name of "Sirdar Aziz Khan"], the repeats are usually in square or oblong blocks. The triangle, diamond, hexagon, and ogee forms of textile repeats are rarely used in the patterning of Oriental carpets. Both the "drop" and the "turn over" forms of repeat are in frequent use. In a few cases a combination of both these forms of repeating gives excellent results.

Border designs are selected for their value and appropriateness as settings or framings for the main or ground patterns of a carpet, and usually for the possibility of their repeating horizontally in fairly long lengths, and for making corner effects without the straining of their general decorative effect.

It is of paramount importance to recollect that, in the designing of carpets, curves that run for great length, in the direction of the warp or woof, should be avoided. Such, in the coarser or medium grades, would lose much of their character as curves, and appear as disjointed lines placed in steps. The best arrangement is for the curves to be so worked in, where possible, that they run diagonally across the carpet at an angle of 45° as nearly as may be. All curves cannot be made this way, if so they would be fatally uninteresting, but this fact is worth recollecting in the planning of pattern.

The "*talim*," "*ta'alim tereh*," "*raqsha kitab*," or book of the pattern, is in general use amongst the carpet weavers of the Panjab. It does not appear to be known to the trade in South India or the Deccan, [except perhaps in His Highness the Nizam's factory at Golconda, where the workmen are the descendants of Kashmiris]. In it is written in signs—a symbol for each colour, with in some cases a repeater sign—the whole pattern of the carpet. The writing represents, stitch by stitch, the pattern as it is to be woven, line by line, across the width of the carpet. The talim is written from the actual carpet to be copied, or from the ruled section paper drawing. It is a simple and convenient method of recording pattern. It bears handling wonderfully well, if written on good Nepal bamboo paper, and it is far cheaper to make copies of the talim than it is to reproduce section drawings. It is easily taught, and not quickly forgotten.

Throughout India and Persia we find that most floral patterns in carpets occur in nearly natural forms, but the rectilinear always influences the flowing lines of nature. Floral forms of ornament found in carpets are, amongst many others, the Tree of Life, the pink, the fritillaria, the lotus, the rose, the ranunculus, various liliums, the poppy, the scilla, the tamarisk, the myrtle, the henna, the narcissus, and the crocus. One finds too the various parts of these plants, foliage, roots, seed vessels, etc. These flowers are generally depicted in their natural colours. In old carpets it is usually found that the colours employed are "the perfect seven."

Animal life is rarely found to be represented on South Indian carpets, except in the form of a dove or blue pigeon, or of a peacock. This is perhaps natural, for nearly everywhere the dove or pigeon has had a place in the history of religion. Pigeons are connected with Islam in fact as well as in hoary tradition. "The doves of the Kaaba," "Allah's proclaimers," were sacred at Mecca long before the time of the Prophet Muhammed, and are still held in special esteem. They accompanied his flight to Medina, and it is recorded that one appeared to whisper to him there.

Hindu forms of animal life are occasionally found in Ayyampett rugs, and of course also in those made from Persian patterns at the Jails and Art or Industrial Schools.

The way in which the various forms in the patterning of carpets have travelled from one centre to another is altogether surprising, so much so that one is always being confronted with what has been described "as the migration of influences"—influences of symbolism, of colouring, of material, of workmanship, and of design—and over these stumbling blocks the most carefully elaborated theories break down. These influences are so wide spread and

many, and have become so interwoven together, as to defy explanation. We find Persian and Turkish forms and influences in the work of Southern India and China, Chinese influence in these countries, and *vice versa*, and latterly, and most unfortunately, European influences affecting the whole character of the carpet weaving industries of all these countries. One would think that the possession of a carpet known to have been designed from an old Ellore-Persian pattern, woven by Muhammadan weavers in, say, Ellore, would be some guarantee as to the South Indian origin of that particular specimen. But it is no guarantee at all, for we shall probably find, if we examine it critically, that part of the design is Moghlai, part is Persian and part Central Asian. This is, of course, due to the migratory character of many of the weavers, and to the fact that all Muhammadans are fond of travel, and make frequent pilgrimages to the tombs of saints, and the more important centres of their religion, and that all who can arrange or afford it, try, once in their lives, to make the Haj, or pilgrimage to Mecca. On the way and on the return journey, they meet other weavers, exchange ideas, see other factories, looms and carpets, and so bring back with them new forms and ideas, which they put into their own work.

Yule says—"The carpets of Cocanada [Masulipatam and Ellore makes] are greatly admired; the ground is white, floral scrolls of blue, red, yellow, and, brown divide them into regular geometrical spaces like a tesselated pavement; a flowery cone being inlaid in each white space, and the rows of cones thus formed are often alternately coloured red, blue, yellow, and brown. The design is Greek in its simplicity; and in its warmth and glow of colour perfectly Oriental, charming the attention, caught by each colour till the next is seen."

In the colouring of the old South Indian carpets, reds broken by quaint stiff flowers or conventionalised leaves, in which orange generally predominates, form a leading feature; cool, low blues, greens of similar gravity of hue, and soft yellows and creamy whites, form the colour scheme, which all bear marked traces of their Persian origin. British carpet dealers have changed this old Indian system. White in borders is sometimes actually bleached, and hard and garish combinations have been introduced, colours naturally become intensified by being flatly uniform, instead of being broken and slightly varying in shade, as the masses of red and other colours are left by the weavers. English and American dealers have had changes, more or less important, introduced into these Oriental designs to suit the colour schemes of the rooms for which they are ordered, often quite irrespective of such matters as balances and values. Good taste and bad taste are alike catered for, with the loss of the exquisite harmony of the old native arrangements of form and colour.

The carpet trade is not now satisfied with the old rich soft colourings, or the variety of patterns and form, which is available amongst the innumerable fine old designs. The demand, the craving, is for something new, something original. And so, fine old patterns are re-coloured to suit the proposed furnishing of rooms, often to the entire debasement of pattern and colour scheme.

A design undoubtedly made and coloured for a long narrow carpet has its proportions altered, colours changed, and a few additions to the pattern perhaps made, to adapt it to the size needed. But it is generally no longer a copy, often nothing but an ill-bred, bastard presentment of the original.

Designs, which would be excellent on a wall, as a hanging, or as a wall paper, are chosen as likely carpet patterns. And every fresh trained textile designer, with the signature on his South Kensington or other diploma hardly dry, must try his hand at a new carpet design "in my own combinations of form and colour," and this the trade often calls "an Oriental Carpet."

Many of the designs sent out are beautiful adaptations or copies of fine antiques, others are ghastly. I saw the other day a spidery design, in which bilious greens and glaring

yellows predominated, and from which twenty-four rugs were to be made. These atrocities were for the continent of Europe.

The colour in old textile tabrics seems to result from a sacred gift to the various races that produced them. The best of the early designers of carpets proceeded in accordance with tradition, and a certainty that was often almost instinct. Of all the artistic powers, colour is the most difficult to teach. Though general principles can well be imparted by rule, a true sense of colour is most rare. It seems to prevail in certain cases as a special gift. It often exists where a knowledge of the value of form is unknown. And it accompanies a quiet sense of sympathy with nature.

Savage nations colour their cloths, or wrappers, or mats harmoniously, though they themselves are absolutely devoid of social or mental cultivation. And, on the other hand, as nations have progressed in scientific attainments, the love of colour, in dress generally, in other ways certainly, is diminished. Europe may cultivate the study of colour and understand its laws; but in textiles of all kinds, from carpets and tapestries, to gossamer muslins, and gold and silver brocades and tissues, the real traditional taste of Oriental nations with their old civilisation is still unattainable by Europeans. And of European nations those most old-fashioned, least changed from the rude ages of the past, retain the greatest enjoyment and feeling of colour.

If the civilized nations of Europe do not equal the less advanced and even the savage races in their appreciation of colours, they are even less happy in their application of designs. In Cashmere, and throughout India generally, much injury has been occasioned to the manufacturers, alike to their skill and to their profits, by European purchasers inducing them to undertake designs from Europe, many of which are, in no sense, fitted for use as carpets, although often good enough in their way for many other uses. The deep tints of native Persian and Indian dyes generally, were, for very many years, at once the aspiration and despair of artistic European dyers. The beautiful elaboration in colour and design, as shown in the old work of the weavers of Persia, the Levant, Turkomania, the Deccan, Kashmir, and South and Northern India can only be injured by interference. The old workmen knew that for the coarser wools of South India, the fine designs of Persia, or the patterning of the fine count and densely piled carpets of Turkomania and Kirman are equally unsuitable, and that only bold patterns can be with advantage used.

"True carpets seem to have been early employed in Persia; and those of Turkey were originally introduced by Persian weavers. The Persians still remain unrivalled in those happy combinations of colour and pattern for which their carpets have for so long been distinguished. In them the most varied hues and deepest tints are brought into close approximation, and, far from offending the eye, please by their striking, because always harmonious, contrasts."

Birdwood says of all classes of old Indian carpets, and especially of the old South Indian makes:—"In all these carpets the first thing to observe is the complete subordination of the decoration to the surface. A carpet presents, of course, a flat surface, and the decoration in these Indian carpets, it will be seen, is never allowed to disturb the impression of their flatness. This effect is obtained by representing the ornamentation on them in a strictly conventional manner, and without shadow. The next thing to observe is the skill with which the ornamentation is distributed, nearly always in a symmetrical manner, and with such perfect balance that even where it is most crowded there is no effect of overcrowding. Then, it is interesting to notice the wonderful variation of the same ornamental forms in all these carpets. No two of them present in the details of their decoration actual repeats of each other, yet in most of them it consists of the knop and flower pattern, that is, of the lotus bud and lotus flower, which has been the universal form among the Asiatic Aryans from the beginning of their art history."

Some one writing of Oriental design, has said recently "that the modern craftsman often uses conventional elements without regard to their meaning"; but the experience of the writer is, that some of them can still see in their designs, "the opening flowers, the gliding fish, and hear the twittering birds; and can feel that they are walking under the curling clouds that arch over the interlacing branches of the richly laden fruit trees." True it is that this feeling is being killed by those who would push the trade in Indian carpets, and treat this art industry as an ordinary manufacture, and by those too who would force upon the workman foreign ideas to which his artistic feelings can never respond."

"A good type of carpet is the so-called Heráti kind. These, doubtless, had their origin in Herát, but have long been produced in India, notably in Lahore, Amritsar, and Agra, [also in the large jails, and often in South India.—H. T. H."]. In 1863, according to Balfour, "upon the carpet industry of Herát being temporarily suspended, most of the weavers emigrated to Birjand. The earliest examples are remarkable for the boldness of the curving stems and the soft cool harmony of the colour, in which is found a good deal of a fine green and deep blue. The border consists, usually, of a broad band separated from the centre and edged on the outer side by one or two very narrow bands. On the broad band, bold and highly conventional flowers alternate with long serrated leaves carried on delicate and gracefully undulating stems." The most striking feature in all these early carpets is the appreciation for the ground, and the proper restraint in the "quantity" of the pattern. There is something Imperial in the great curves and bold touch of the designers, who command ample breadth while achieving extreme closeness of stitch. Their work never looked crowded, and there was always a proper proportion of border to field. To the artist and designer, one of the most striking features of these Heráti designs is the extremely skilful choice and use of outlining colours. "To instance a few examples—on a deep red ground a rose pink will be outlined delicately with white; a dull yellow, with dull green or pale blue; a dull green with white, and a deep indigo with dull yellow. On a dark blue ground we find light blue outlined with dull yellow; red with white; dull yellow with salmon pink, and so on.

A few modern carpets, made in India after the old patterns, are quite equal in quality to the early ones; but, as a rule, the weaver of to-day has not the broad ideas and fine sense of form and colour of his ancestors. "His patterns lack repose, he somehow misses the spirit of the early work. The whole carpet seems somehow to suggest bustle and business—London, Vienna, Paris or New York—that it is part of a consignment for a bustling firm. Or it is too geometrical in its arrangement, as is usually the case with the silken carpets of Warangal in the Deccan. And there is no doubt that the material used to-day is not equal in quality to that of the past. Business considerations put 'mixed' wool into the work." [The use of such wool leads to uneven 'mellowing,' and to a poor patchy effect.—H. T. H.]

"Dyeing has been much affected by Western influences and by common imported German dyes. The old Persian test of dropping a piece of live charcoal on to the face of the carpet, to see if any traces of the injury remained after brushing away the singed top, is one we should not care to apply to any modern carpet." *Andrewes* 'Journal of Indian Art,' Vol. XI. [I have found by actual experiment that a well woven 12 stitch carpet will safely stand this test.—H. T. H.]

Sir George Birdwood's views on "The Termless Antiquity . . . of Oriental Carpets" Vienna Carpet Book—are worthy of reference here.

"The decoration of textile fabrics was at first extremely ritualistic, and pre-historically it would seem to have originated in tatooing, from which the rich symbolical vestments worn by kings and priests have, in great part of the world, been obviously derived. The practice was once universal and is still widespread, and where it yet survives is invariably ritualistic, indicating the relation of those so 'stigmatised' to their tribes and tribal divinities . . .

Already at the time of the composition of the Iliad and Odyssey these textiles had acquired the ritualistic Euphratean types by which they have ever since been predominantly characterised throughout Central, Southern and Western Asia, as also in their passage through Phoenicia and Phrygia into Europe." He considers that "the coloured slabs and other decorations discovered by Layard in the ruins of Nineveh and Babylon all incontestably prove that, in design and colour, the carpets woven in India, Persia and Central Asia to-day, are the same class of carpets as were used for awnings and floor covering in the palaces of Sargon, Sennacherib, Esarhaddon, and Sardanapalus, "the great and noble Asnapper" of the Book of Ezra. The stone slab from Koyundjik [palace of Sennacherib, B.C. 705–681], and the door sill from Khorsabad [palace of Sargon, B.C. 722–703], are palpably copied from carpets, the first of the style of the carpets of South India, and they were probably coloured like carpets.

"The South Indian carpets probably approach in their bold designs and archaic force of colouring nearest to their Euphratean prototypes . . . The Italianesque style introduced in the treatment of modern North Indian and Persian carpets, and with local modifications of the Ellore, Masulipatam and other denominations of Indian carpets, if somewhat of a departure from the traditionary Euphratean mode is yet undeniably pleasing, and on account of its broken patterning and generally diffused colouring, better adapted to carpets intended for European rooms, where they are overcrowded and overshadowed by the furniture, than the severely co-ordinated designs and immense masses of clearly-defined, deep-toned colours of the more unsettled parts of Persia.

"Notwithstanding, however, the sweet charm of the Abbasi Persian carpets of modern trade, the palm for pre-eminent artistic merit above that of all other denominations of Oriental carpets now manufactured for merely commercial gain, must be awarded to those of Southern India for their perfect adaptability to European domestic uses, and on account of the marvellously-balanced arrangement of their colossal proportions, and the Titanic power of their colouring, which in these carpets satisfy the feeling for breadth, and space, and impressiveness in State furniture, as if they were indeed made for the palaces of kings and the temples of the gods: and these Southern Indian Carpets, the Masulipatam and Ellore makes derived from the Abbasi-Persian without a trace of the Saracenic or any other modern influence, or both, relatively to their special applications, the noblest designed of any denominations of carpets now made."

EXTRACT FROM MONOGRAPH ON THE WOOLLEN FABRIC INDUSTRY OF THE MADRAS PRESIDENCY.—E. THURSTON (1898).

"I may with advantage quote from an industrial report by the Hon'ble Dr. D. Duncan, Director of Public Instruction, who writes as follows:—'Carpet-weaving is carried on, more or less, in seven districts, the chief seats of the industry being, however, Ellore, Masulipatam and Ayyampet. The industry has sadly declined as regards the extent to which it is carried on, and, some think, in the style and finish of the manufactured article. On a recent visit to Masulipatam, I found that the industry had, in recent years, shrunk in extent, and deteriorated in the quality of the carpets. I visited several of the principal carpet-weaving establishments, but in none of them did I see anything, which could be favourably compared with the high-class carpets and rugs of Ellore. At Ellore the industry has dwindled into comparative insignificance. This may be due, not to a falling off in skill on the part of the weavers, but to the fact that no high-class carpet had been ordered about the time of my visit. There are now only sixteen important weaving establishments, and carpets and rugs are almost entirely made to order. The industry is carried on almost exclusively by Muhammadans, who, like this community in most other places, are very poor. They have

no capital, wherewith to purchase the materials or to maintain themselves during the time the carpet is being made. Consequently, when a carpet is ordered, an advance of money must be made. Some Madras firms, such as Messrs. Arbuthnot & Co., have an agent at Ellore, who advances the money required by the carpet-weavers, and generally superintends the execution of the work. The carpets are mostly intended for the European market. The approximate annual value of the carpets manufactured at Ellore is Rs. 100,000.'

'It is a great pity,' Dr. Duncan continues 'that an industry so highly spoken of should be allowed to decline, until it threatens to become extinct. The excellence of the colouring is no doubt due to the fact, regarding which I made enquiries when I visited the carpet-weavers at Ellore, that only native dyes are used. There are ten principal colours, viz., white, green, orange, rose, red, black, sky-blue, burnt-umber, ivory-white and kháki. The patterns, I was informed, were brought by Kabul merchants many years ago. The old patterns are strictly adhered to, unless customers wish it otherwise; but any simple pattern can be imitated. The preparation of the dyes, and the dyeing of the wool, are done by the women of the family; the weaving being done by the men and boys. The weaving is carried on in sheds, which are generally somewhat deficient in light and ventilation. The poverty of the carpet-weavers is the chief obstacle in the way of improvement, and, in addition, there are, as Mr. Havell says, 'the unbusiness-like habits of ordinary native workmen.' A steadily growing demand for the best productions of the looms would tend to ameliorate the economic condition of the weavers, and, by alleviating the extreme pressure of dire necessity, might, in course of time, permit of the growth of keener artistic sense, and greater pride in their work, and a determination to maintain a high standard of excellence in material design and finish. At present the poverty of the workers tends to keep ever prominently before them the immediate money return, which they look to for their labours —a condition most unfavourable to excellence of workmanship.'

"The following information, bearing on the subject of the Ellore carpet industry, was elicited in the course of an interview with Messrs. Arbuthnot & Co. Four primary patterns are, at the present time, being shipped to London under orders from the firm of Messrs. Maple & Co., viz., Ashan Khány, Parsey Khány, Gulbundi Umbasha Khány, and Gopal Rao Khány. The demand is greatest, in the English market, for the two first. Vegetable and other indigenous dyes are used. Sometime ago the Superintendent of the Vellore Jail asked Messrs. Arbuthnot & Co. to ascertain how the beautiful Indian red vegetable dye was made. The information was not forthcoming, as the preparation of the dye was said to be a secret process, handed down, like that of the manufacture of some liqueurs, from generation to generation. Carpets with an Indian red centre look like silk, when made of extra quality. The different qualities of Ellore carpets, now manufactured, are as follows:—

(*a*) Ordinary—Rs. 6–8–0 per square yard delivered in Madras.

(*b*) Exhibition—Rs. 10 per square yard.

(*c*) Extra exhibition, containing 144 stitches to the square inch, Rs. 12–8–0 to Rs. 15–0–0 per square yard.

"The size of the carpets averages from 7′ × 4′ to 30′ × 20′. The so-called white centre of the carpets is really camel or ivory [creamy] white, the former being the darker. [As Mr. Dresser points out, 'If the ground of a carpet is pure white, it is almost impossible that it looks well. When I make this assertion, I am often told that some of the Indian carpets, which I do so much admire, have white grounds. This is a mistake. Some of them have light grounds, but not pure white. They have light creamy-grey, or green-white grounds, but not pure white, and this variety of tone altogether alters the case.'] At the present time there is a demand for the 'Jumphul' border by all orderers of carpets. The

Ellore agent has received four old patterns, which he sends out with numbers, but without specific names. Nearly all the carpets are made on an imported English hemp-twine foundation. Occasionally a cotton foundation is used; a carpet on a hemp-twine foundation will not spoil if it happens to get wet. The carpet-weavers at Masulipatam imitate the Ellore patterns, but use inferior materials, and the workmanship is indifferent. They put them on the market at a cheaper rate, and undersell Ellore. The twine is mixed with 'Jute' from the Bombay mills, and mineral dyes are used. Some years ago Messrs. Arbuthnot & Co. executed an order for ready-made Masulipatam carpets at the instance of an American firm in Boston. But the result was not a success, as the carpets wore badly. One effect of the competition of jail-made carpets is said to have been that the hereditary weavers receive advances of money from the principal carpet manufacturers, and it is then difficult to get any work out of them, as the rates are so low.

"The demand for Ellore carpets seems to be fairly well maintained, as Messrs. Arbuthnot & Co. supply them annually to the value of 1½ lacs of rupees. Messrs. V. Robinson & Co. have a loom at Ellore, with a Muhammadan agent who is under engagement with Messrs. Arbuthnot & Co. to supply them only with carpets.

"The suggestion has been put forward by Dr. Duncan that, if carpet-weaving is continued at the Madras School of Arts, two or three scholarships might be offered yearly to boys belonging to the carpet-weaving families in Ellore, Masulipatam, and Ayyampet, to enable them to join the School of Arts. On completion of their school course, they would mostly return to their homes, carrying with them wider and more accurate knowledge, and, if not a higher manipulative skill, a more intelligent appreciation of the technique of carpet-weaving. The experiment would seem to be well worthy of a fair trial, provided that the lads' parents will allow them to quit their ancestral home; and their consent to such a measure is by no means certain.

"In 1895 a Committee, with myself as Secretary, was appointed to report to Government on the working of the Madras School of Arts. In connection with carpet-weaving, the Committee submitted a series of questions to the officiating Superintendent, Mr. E. Holder. These questions, with the replies thereto, were as follows:—

1. Number of weavers engaged and where they were obtained from.	Three men were engaged when the class was first started, one from each of the three towns famous for carpets in South India, *viz.* Warangal, Ellore and Ayyampet. At present there are two weavers, the Warangal man having left the school in 1892. These men act as teachers to students who do all the weaving as class work. For urgent orders, passed students from the Anjuman and the School of Arts are occasionally engaged on daily wages.
2. Pay of weavers.	The two Maistries are paid Rs. 40 and 20 per mensem, respectively. The extra men employed for urgent work receive from 4 to 6 annas per day. Students learning the work are paid stipends from Re. 1 to Rs. 7–8–0 per mensem according to progress made and examinations passed.
3. How are patterns selected?	In this, as in all the other industrial classes in the school, students are taught to make their own designs, always keeping in view as examples of the best carpets those illustrated in 'Oriental Carpets' and the coloured designs sent from the South Kensington Museum, which are sometimes copied, with slight modifications, when specially required by any person.

4. What dyes are used?

Only pure native dyes are used, no aniline dyes. All the dyeing, except indigo, is done in the school. White, brown and sometimes black wool is obtainable in the natural state. For blue of various shades indigo is used; for black, sulphate of iron and gall-nuts; for red, stick-lac; for yellow, turmeric, and the patas or moduga flower (*Butea frondosa*). The secondary tints are obtained in the ordinary way by mixing two of the primary colours together.

5. Size of carpets made. Any demand for sma'l rugs?

The looms in the school are constructed to weave carpets of various widths from 3 feet to 21 feet, and of any proportionate length. Very large carpets are not much in demand here owing to the costliness of the material, the price being from Rs. 8 to Rs. 12 per square yard. For very small rugs too the demand is not great. The sizes generally ordered range from $7' \times 4'$ to $15' \times 9'$.

6. Number and value of carpets manufactured since the industry was started.

About fifty carpets have been completed up to date.

7. Is demand in excess of supply?

This being a class for instruction, and the majority of the students being mere boys, who, in addition to weaving, have to attend the drawing and general education classes daily, the work turned out is not even half of what could be done in a regular manufactory employing adults. The demand, therefore, is in excess of supply, as is the case of all the other industries in the school, except pottery.

8. Have any of the weavers gained employment outside the school? If so, where?

No students trained in this class have at any time obtained employment as weavers outside the school. They join the class merely for the sake of the scholarships, which enable them to continue their studies in the drawing classes for the group certificate and diploma. Most of the students from this class, after completing their course, have gone out as drawing teachers or draughtsmen.

9. Is there a field for skilled weavers outside the school?

Local enterprise, I may safely say, has been completely ruined by the jails taking up this industry. The best carpets now manufactured in this Presidency are those turned out in Vellore and Bangalore Jails, so far as texture is concerned, and even design, for illustrations of the best carpets can now be very easily procured. Besides, what they do in jails ordinarily is to have a few select patterns of borders and ground, which are repeated over and over again, with slight modifications, as regards color, proportion, &c., the work being intended merely to keep the prisoners employed. The men generally put to such work are the 'lifers' and 'long-term men,' who, by constant practice, become really expert weavers, as good in the technical portion at least as any professional.

"The Committee noted that no students, trained in the carpet-weaving class, had at any time obtained employment as weavers outside the school, but that they join the class merely for the sake of the small scholarship, which enables them to continue their studies in the drawing classes. In view, however, of the proposal for the establishment of a school of dyeing, the Committee considered that the carpet-weaving industry should not be abolished at any rate for the present, and suggested the advisability of attention being paid to the improved manufacture of small cheap rugs of good design, instead of the manufacture of large and costly pile carpets." E. THURSTON.—'Woollen Fabric Industry of the Madras Presidency,' 1898.

LIST OF QUESTIONS, UPON THE REPLIES TO WHICH SOME OF THE INFORMATION GIVEN IN THIS MONOGRAPH IS BASED.

1. What is the number of carpet weavers working in the District, or in your factory?
2. (*a*) What is the average size of looms?
   (*b*) What is the length of the largest looms in use?
   (*c*) What is the total number of looms?
   (*d*) What is the total length of loom space, in feet?
3. Do the weavers combine agriculture or other occupations with weaving?
4. Do the families of the weavers work at cleaning and spinning wool, and weaving, dyeing, etc., or is this done by the men and boys only?
5. From whence do the weavers get their wool? is it ready spun, or do they tease, clean, wash and spin it themselves? describe the methods in use.
6. What qualities of carpets are principally made? State stitch counts per inch.
7. Describe the wools in use, and send samples of yarns.
8. Are cotton, hemp, hemp and jute, or jute yarn or thread used for warping and for wefting?
9. How are the weavers paid; if piece work, state the number of stitches per rupee, and the quantity of a given stitch count usually woven in a day by a steady weaver?
10. What is the class of carpet or rug usually made?
11. To what market does the output go?
12. What is the finest stitch grade carpet or rug that is made?
13. And the coarsest?
14. State your experience, so far as cost, colour-value, and permanency are concerned, of—
   (*a*) Vegetable and other indigenous dyes.
   (*b*) High class alizarine, chrome, and other fine chemical dyes.
   (*c*) Cheap low-grade aniline dyes.
15. Has synthetic indigo been given a trial; if so, state your experience of it, as compared with the indigo made in the Madras Presidency, or other make of indigo known to you?
16. Describe in detail the process followed for preparing the indigo for use, and in dyeing with it?
17. Have you any knowledge of either of the following dyeing processes for indigo; if so, state your experience of those known to you?
   (*a*) Indigo, ferrous sulphate and lime.
   (*b*) *Sour vat*—indigo, lime, crude soda, and jaggery.
   (*c*) *Sweet vat*—Indigo, lime, latti, and jaggery.
   (*d*) Indigo and sulphuric acid; sulphindolic acid, (*neel-ka-marubba*).
18. State the ingredients, quantities and processes employed to dye 10 lb. of woollen yarn in the following colours:—

19. Deep crimson.
20. Scarlet.
21. Terracotta.
22. Copper red.
23. Orange.
24. Dull old gold.
25. Deep yellow.
26. Bright yellow.
27. Lemon yellow.
28. Pale blue.
29. Deep blue.
30. Sapphire blue.
31. Purple.
32. Sap green.
33. Light green.
34. Pea green.
35. Olive green.
36. Bronze green.
37. Grape green.
38. Dark brown.
39. Nutty brown.
40. Light brown.
41. Khaki.
42. Buff.
43. Camel colour.
44. Cream.
45. Deep rose colour.
46. Pale rose colour.
47. Flesh pink.

48. Is the dyed yarn washed in running water, or steeped to remove excess dyes? And is it beaten? if so how often, or for how long?

49. Are "topping," over-dyeing, or second dyeing with anilines or alizarines practised, to bring up brightness in dead dull shades?

50. Do you know any way of removing the offensive smell from dead, or "chunam" wool, without making it harsher and more brittle, if so please state it?

51. Is there a ready sale for carpets? state sizes, designs, and quality in most demand.

52. It is understood that large numbers of carpets, and rugs (especially the latter), are made for consignment and shipment to the auction and sale warehouses in Cutler Street, London. Has this largely affected the local "order trade," which used to be a considerable factor in the industry?

53. What designs are in most demand for the warehouses, and what for the order trade?

54. Are many designs, which are either combinations of antique patterns, original European ideas, re-casts and recolourings, sent out from England or other countries to be copied?

55. Are shipment or warehouse carpets usually woven against advances, or are advances only given when the goods have reached the hands of the shipping agents on the coast?

56. Has Indian mill-spun or imported hard twist woollen yarn been tried for fine carpets? if so, what opinions have been received regarding such from the trade or from customers; give, please, your own opinion also.

57. How does the present price of wool and woollen yarn compare with the prices ruling in 1903, 1904, 1905, 1906.

HENRY T. HARRIS.

STATISTICS.

A.—Statement showing the Sea-borne Trade in Carpets and Rugs from Madras Ports from 1895–96 to 1905–06.

Years.	Imported from Foreign Countries.		Exported to Foreign Countries (Indian produce).		Remarks.
	Quantity.	Value.	Quantity.	Value.	
	LBS.	RS.	LBS.	RS.	
1895–96	*2,614	3,017	389,780	2,00,292	
1897–98	10,564	10,340	584,814	3,17,690	
1900–01	17,875	22,684	234,245	2,15,389	
1901–02	11,600	15,606	171,605	1,82,810	
1902–03	12,742	18,351	206,600	2,11,076	
1903–04	17,024	16,601	253,319	2,57,053	
1904–05	22,894	18,695	238,717	2,09,724	
1905–06	15,925	22,833	277,892	2,21,608	

* From November 1895 only.

B.—Statement showing the Exports by Sea of Indigo and other Dye-stuffs to Indian Ports as well as to Foreign Countries, for a series of years from 1880–81 to 1905–06.

Years.	Indigo (Indian Produce)				(Indian Produce) Other Dye-stuffs			
	Exported to Foreign Countries.		To Indian Ports.		Exported to Foreign Countries.		To Indian Ports.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	CWT.	RS.	CWT.	RS.	CWT.	RS.	CWT.	RS.
1880–81	25,295	62,35,370	702	1,80,673	181,915	5,36,839	76,283	4,16,219
1890–91	40,696	89,41,214	267	55,640	158,271	5,06,733	135,908	11,94,869
1895–96	62,425	1,40,21,259	423	84,443	163,847	4,66,134	152,525	8,91,312
1897–98	48,165	1,06,64,447	1,442	2,54,538	88,484	2,55,160	95,498	7,34,052
1900–01	18,940	39,25,851	43	10,200	178,106	6,41,091	87,329	10,14,893
1901–02	25,400	49,35,525	369	61,049	144,263	5,08,047	140,421	15,64,770
1902–03	32,242	49,13,604	498	1,11,201	173,114	5,66,648	138,879	9,75,051
1903–04	24,414	38,39,663	40	8,336	133,873	3,90,308	74,982	4,56,545
1904–05	11,901	16,85,409	...	...	224,616	7,00,518	58,272	3,34,137
1905–06	7,756	11,56,349	...	...	227,041	6,81,484	40,158	3,21,415

C.—Statement showing the Quantity and Value of Dyeing and Tanning Materials imported by Sea from Foreign Countries into the Madras Presidency for a series of years from 1880–81 to 1905–06.

Years.	Alizarine Dyes.		Aniline Dyes.		Cutch.		Gambier.		Indigo.		Myrabolams.		Saffron.		Turmeric.		Other Sorts.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	LBS.	RS.	LBS. Oz	RS.	CWT.	RS.	CWT.	RS.	CWT.	RS.	CWT.	RS.	LBS.	RS.	CWT.	RS.	CWT.	RS.
1880-81 ...	...	...	25,920	6,332	...	...	...	..	...	...	...	...	86	2,613	...	...	1,757	19,750
1890-91 ...	119,299	62,100	Combined with Alizarine.		6	123	42	978	..	...	1,785	4,368	22	883	...	...	1,412	10,021
1895-96 ...	235,292	1,32,318	7,553	6,031	6	192	154	3,270	55	12,363	448	1,873	...	...	10	50	864	10,636
1897-98 ...	342,434	1,57,781	9,250	11,768	20	454	190	3,864	lbs. 2	4	782	3,173	45	1,585	8	84	1,430	21,169
1900-01 ...	1,298,717	5,90,671	100,848	1,25,825	3	68	324	5,758	1	2	1 409	4,426	60	1,615	1	27	3,581	60,769
1901-02 ...	755,264	3,81,958	132,442	1,40,587	6	114	304	7,680	55	84	86	279	38	870	lbs. 19	2	2,381	54,817
1902-03 ...	992,264	5,13,229	141,208	1,48,178	1	19	290	7,421	cwt. 265	36,635	2,815	7,675	oz. 2	3	52	4	2,595	45,015
1903-04 ...	1,115,739	5,58,790	155,635	1,50,108	4	82	383	8,896	18	2,909	784	2,224	lbs. 88	1,041	cwt. 18	33	2,955	52,347
1904-05 ...	941,189	4,93,836	148,601	1,40,267	7	147	361	8,016	294	54,321	580	1,595	...	..	lbs. 20	3	2,333	39,261
1905-06 ..	1,121,599	5,44,740	195,530	1,41,869	45	700	394	11,365	91	9,927	3	15	50	720	7	1	3,123	65,374

D.—Statement showing the Trade of the Madras Presidency by Rail in Alizarine and Aniline Dyes with External Blocks from the years 1890–91 to 1906–07.

Years.	Imports.		Exports.		Remarks.
	Quantity.	Value.	Quantity.	Value.	
	INDIAN MDS.	RS.	INDIAN MDS.	RS.	
1890-91	254	19,161	43	7,493	
1895-96 ... ... *	735	85,703	303	44,579	
1897-98	2,066	1,14,953	119	10,695	
1900-01	1,867	1,15,868	836	82,827	
1901-02	1,990	1,34,653	59	5,764	
1902-03	3,607	2,33.171	138	12,406	
1903-04	5,731	3,57,542	104	8,822	
1904-05	6,379	3,88,753	262	15,653	
1905-06	6,794	3,88,865	322	19.222	
1906-07	5,965	3,31,987	132	7,333	

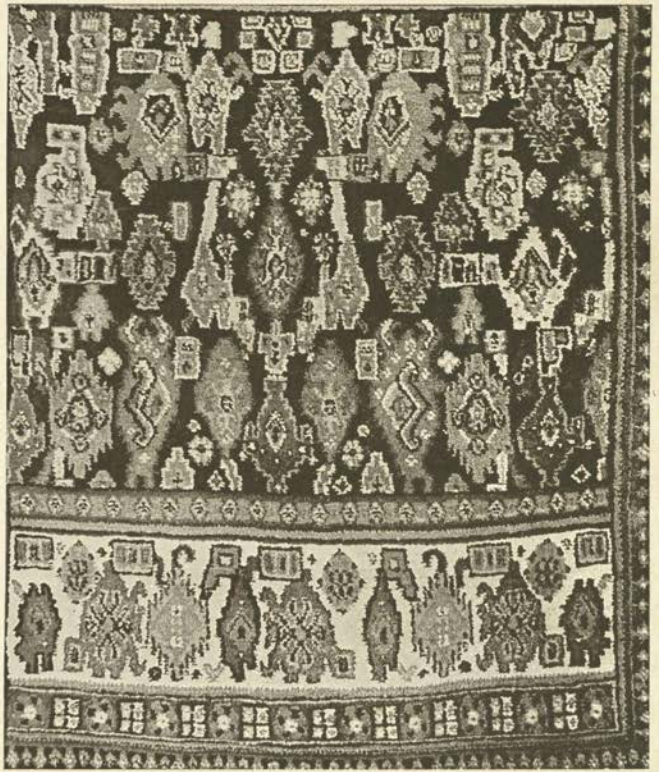
* Figures for these years, relate only to aniline dyes.

APPENDIX.

NOTE BY THE SUPERINTENDENT, SCHOOL OF ARTS, TRIVANDRUM, ON SILK FABRICS IN THE PALACE AT TRIVANDRUM.

There are but few carpets in the palace more than fifty years old, and they are all of foreign, and not of Indian manufacture. The terms Malabar, Zamorin, or Hindu rugs, are not known here either in English or vernacular. Carpets, as a rule, do not appear to have been used in olden days in the palace, but every important room was furnished with grass mats in coloured designs specially made at Kavalaparay in Malabar, which is still famous for the industry. It is doubtful whether the manufacture of carpets, either in wool or silk, was ever an indigenous industry in Malabar. It is almost certain that, in Travancore or Cochin, carpets were never made before. Sir George Birdwood (Industrial Arts of India) does not specify the place, nor does he mention the period during which the industry flourished in Malabar. The terms "carpets" and "rugs" seem to be often applied to other fabrics which are made and used for spreading on the floor.

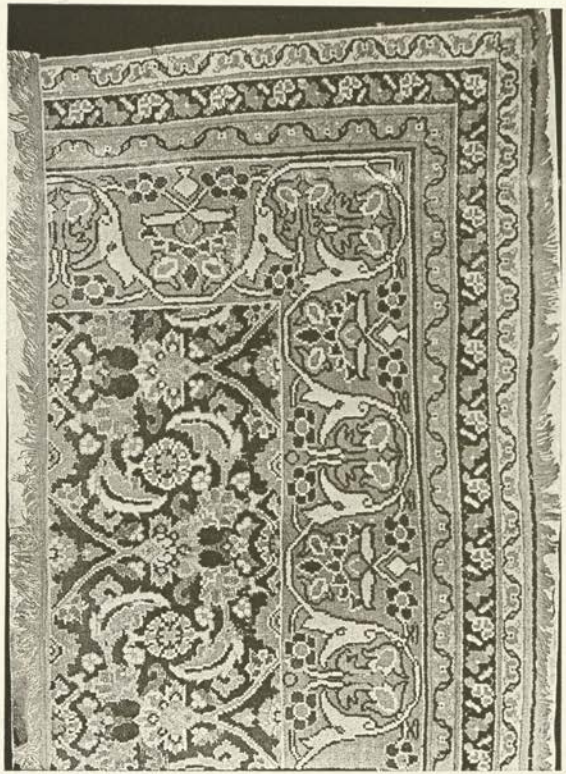
The above facts induced me to search every old and valuable fabric available in the palace, and a few very old specimens of silken stuff were found. The silks are generally 6 to 7 yards long by 1½ yard broad, and appear to be more than a hundred years ago. They are called veera-kali, veera-vali, and veerali silks. The name veera-kali is locally explained by these fabrics having been greatly used in the pagodas of the goddess Káli, veera meaning rough or ferocious. This interpretation appears to be rather far-fetched. The silks were certainly used in the palaces, and in conferring certain local honours, it was the custom for the Maharajahs to present a silk of this variety, either to tie round the head like a turban, or to spread on an elephant's back for a procession. They are made of very rough silk, which does not even compare in its gloss with coarse tasar silk. Veerali thus might mean rough or coarse worm or beetle, and may have been the original name by which it was at first known, the change into veera-kali being an ingenious mistake. The patterns show that the artisans must have taken much trouble in the weaving process. The fabrics are not only pretty, but also costly. Each of the silks photographed is worth more than Rs. 150. There is a belief prevailing in this country that the silk, charred or otherwise, is a valuable medicine for several diseases, and that other silks are not so, and consequently its value is high in spite of the deficiency in gloss and texture. These silks are now very rare in the palace, and hardly found in the possession of private individuals. They are somehow in great demand in the country for various religious ceremonials even at the present day, but, owing to their scarcity, common silks are substituted for them.



a.

b.

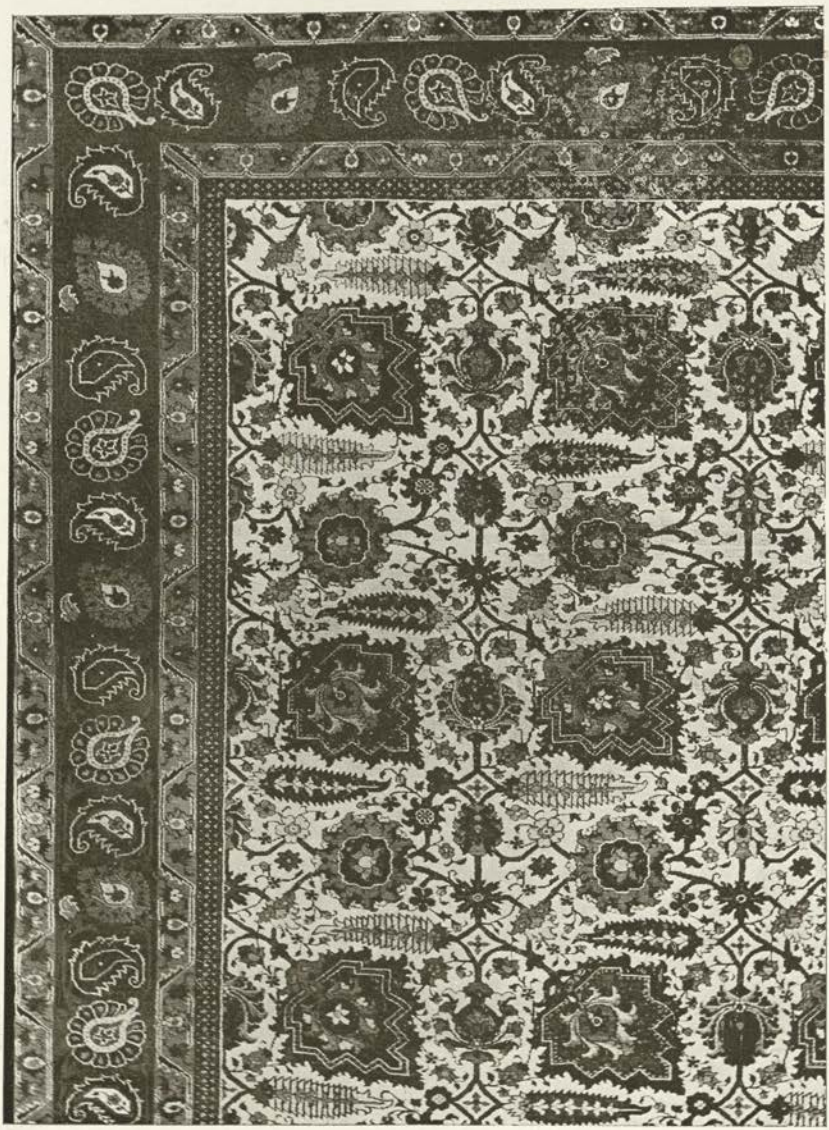
a.—MADE AT THE VELLORE CENTRAL JAIL from, undoubtedly, in the first instance, a good specimen of sham orientalism.
b.—RUG MADE AT THE VELLORE CENTRAL JAIL. Probably a copy of an old Wallajahnagar rug.



a.

b.

RUGS MADE IN THE VELLORE CENTRAL JAIL. Both are forms of the "Fish," "Herati" or "Collector" pattern.
(b).—Shows the crescent leaf, in a fish-like form, especially the midribs and general outline, which suggest a fish in motion. The border of (a) is a frequent Moghul form.



CARPET MADE IN THE SCHOOL OF ARTS, MADRAS.

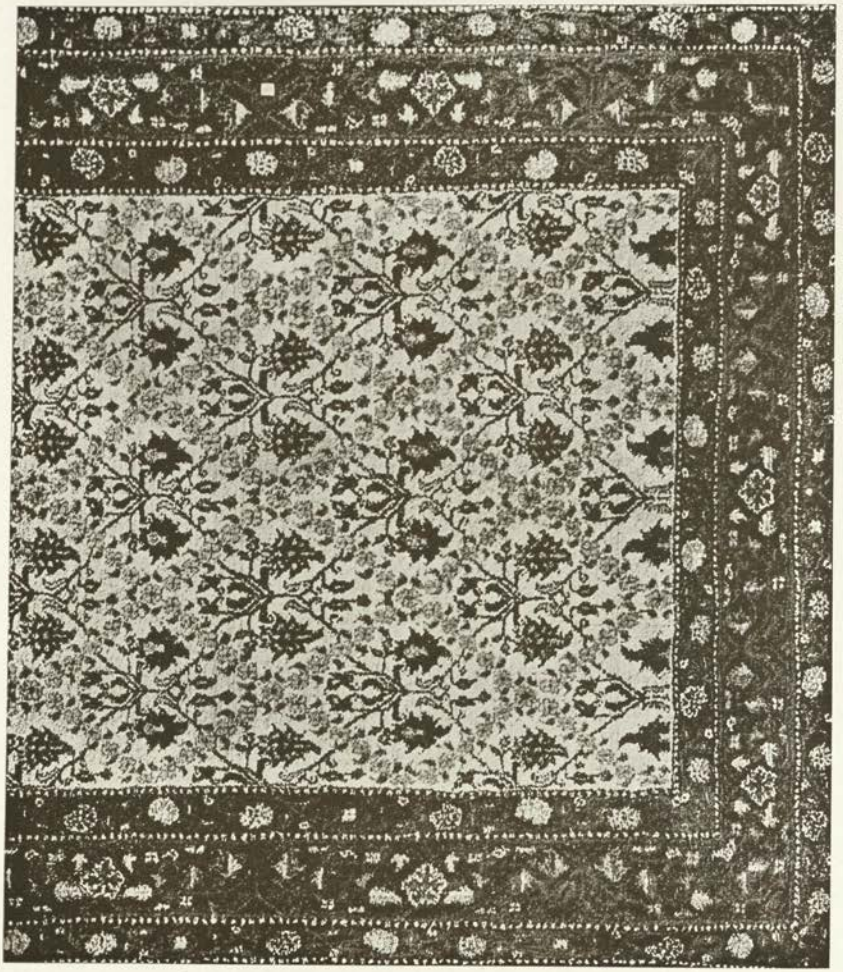
The border illustrates three forms of the 'cone of flame' or 'pine' device. The ground is a slight variant of a Persian design in 'The Vienna Carpet Book.'

a.

b.

a.—PRAYER RUG MADE AT THE ANJUMAN INDUSTRIAL SCHOOL, MADRAS. The three forms of flowering plants represent various forms of the Tree of Life. The Arch *(mihrab)* and the border are very uncommon, and suggest marked Chinese, or possibly Malayan influence. The lamp represents the lamp of faith, or lamp of Islam.

b.—CARPET MADE AT THE ANJUMAN INDUSTRIAL SCHOOL, MADRAS. This pattern is said to have been originally adapted from an old Moghlai rug. The cloud bands in the ground have been changed and compressed into something of the semblance of headless snakes. The border is a good old Lahore one.



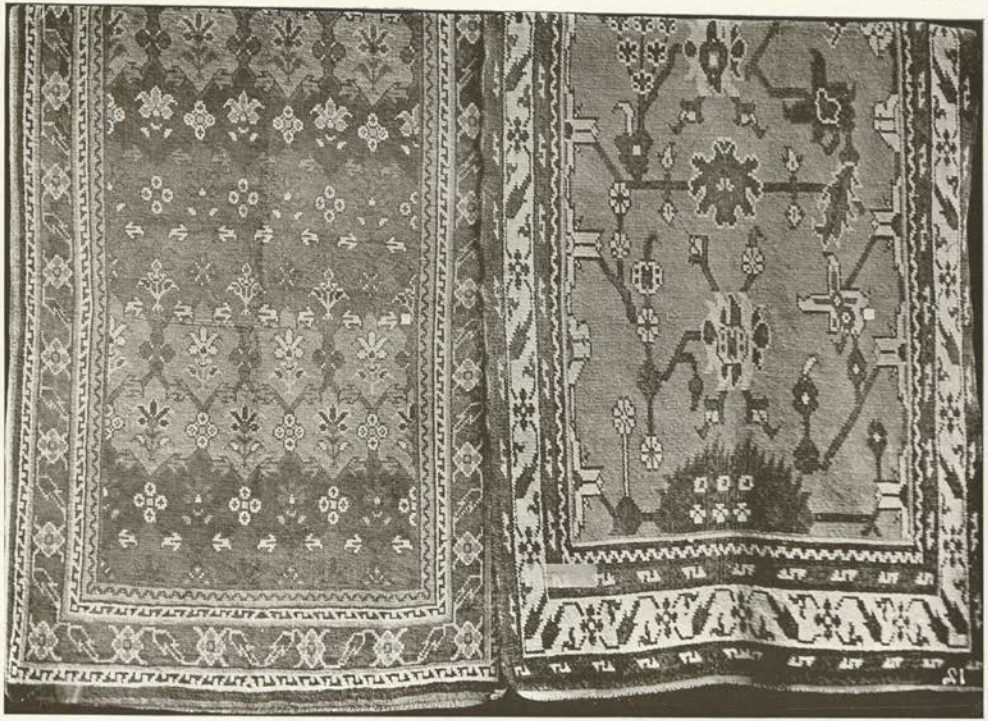
CARPET MADE AT THE ANJUMAN INDUSTRIAL SCHOOL, MADRAS.
The design is a local (Ellore) modification of an old Moghlai pattern.

PRAYER RUG MADE AT THE ANJUMAN INDUSTRIAL SCHOOL, MADRAS.

The original was made at Ellore about 60 years ago, and was probably copied from an old Ghiordes (Anatolian) rug.

RUG MADE AT THE ANJUMAN INDUSTRIAL SCHOOL, MADRAS.

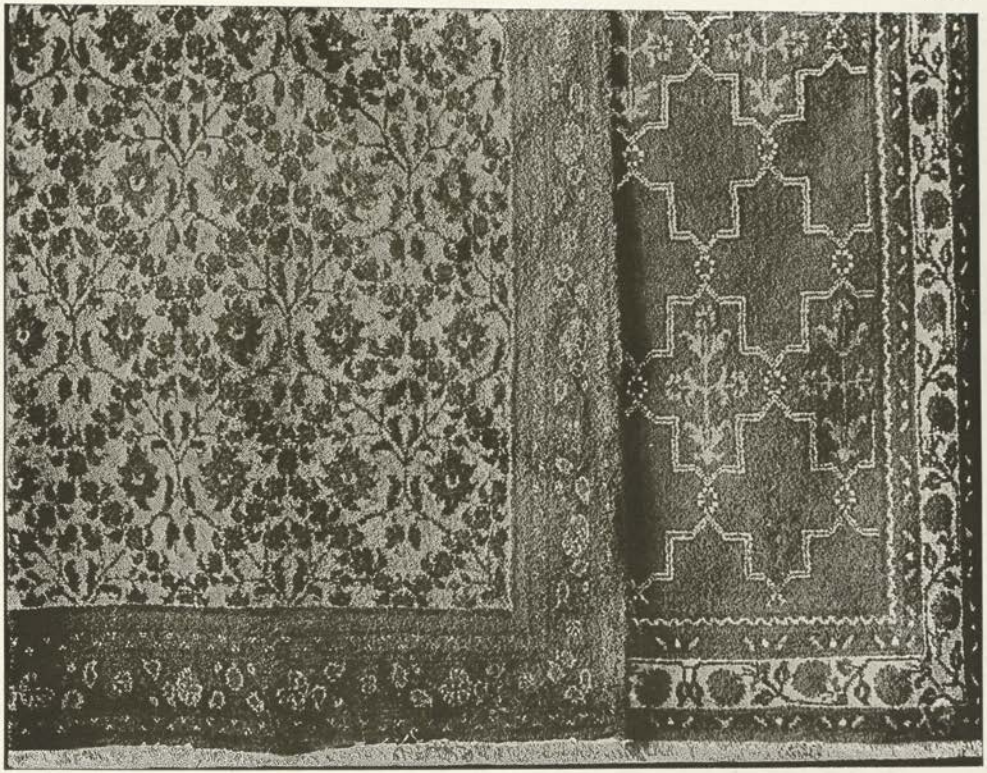
The original was probably an old Moghlai carpet. Old Ellore weavers say that, many years ago, rugs to this pattern were made there, and that "Furreed Khan" brought the original from Bijapur, but with an altogether different border. The design is not now in Ellore.



a. b.

a.—FIBRE CARPET FROM THE COIMBATORE CENTRAL JAIL. A much debased form of one of the old Lahore "flower garden" designs.

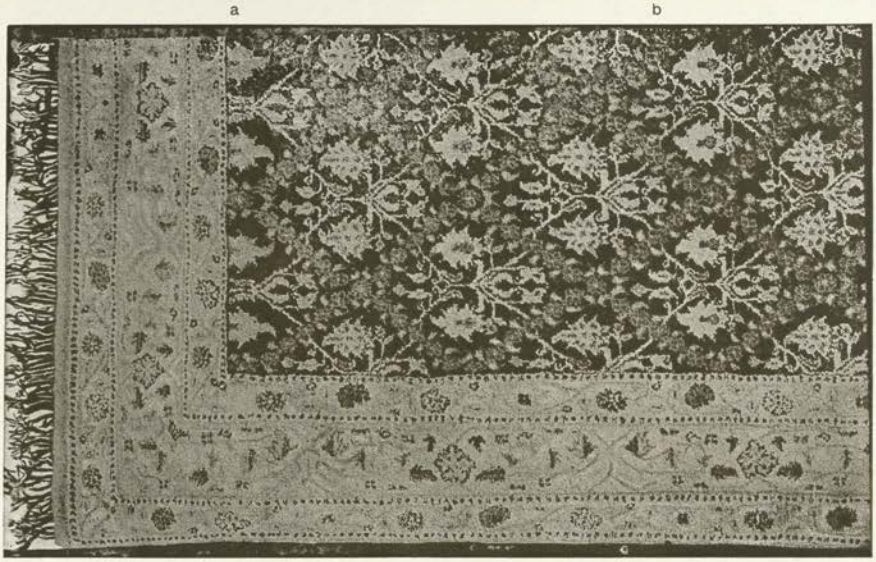
b.—COTTON CARPET FROM THE COIMBATORE CENTRAL JAIL. A much attenuated form of the Ellore "Persian" pattern.



a. b.

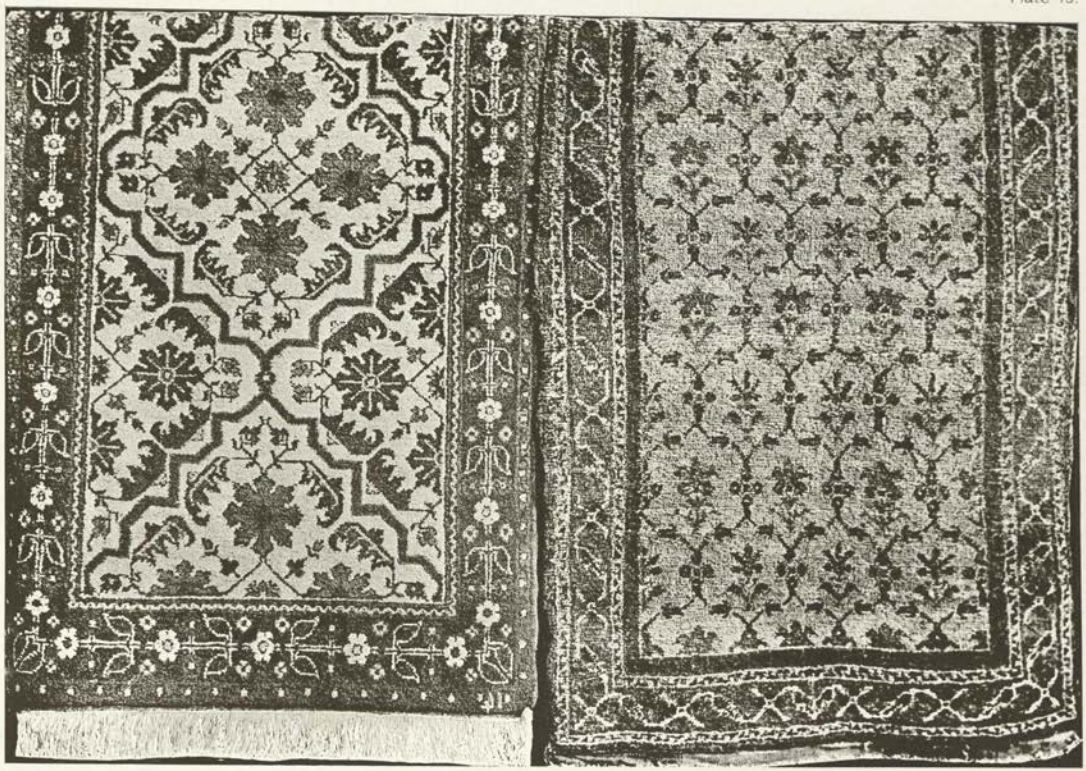
a.—ELLORE-MADE RUGS, a "Garden" pattern; has lost much character from weaving in coarse stitch quality.
b.—A DIAPER in two grounds patterns. Good specimens of Ellore "trade" rugs.

a b



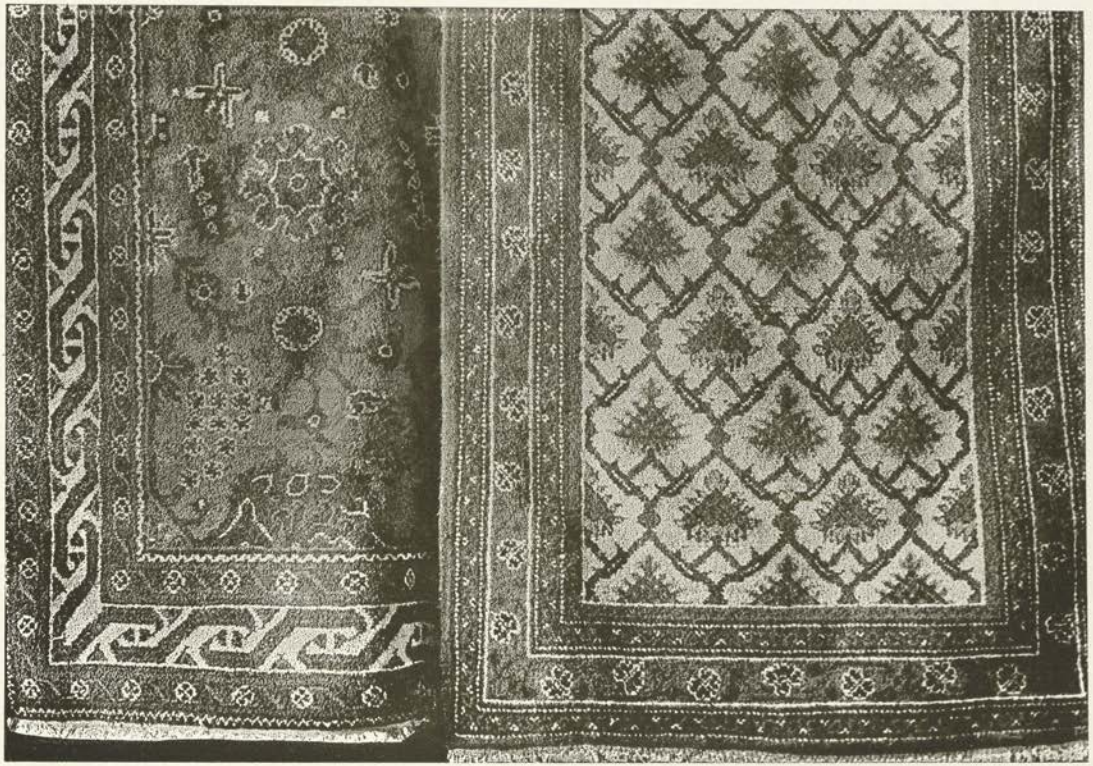
c

a. b.—Rugs from the Rajahmandry Central Jail.
c.—Carpet from the Vellore Central Jail.
a, is apparently a comparatively modern attempt at copying a "broken pattern" Turkistan rug.
b, a form of the Crown jewel, Pine, or River loop device.
c, is a local form of a Flower-garland pattern of Moghlai character.



a. b.

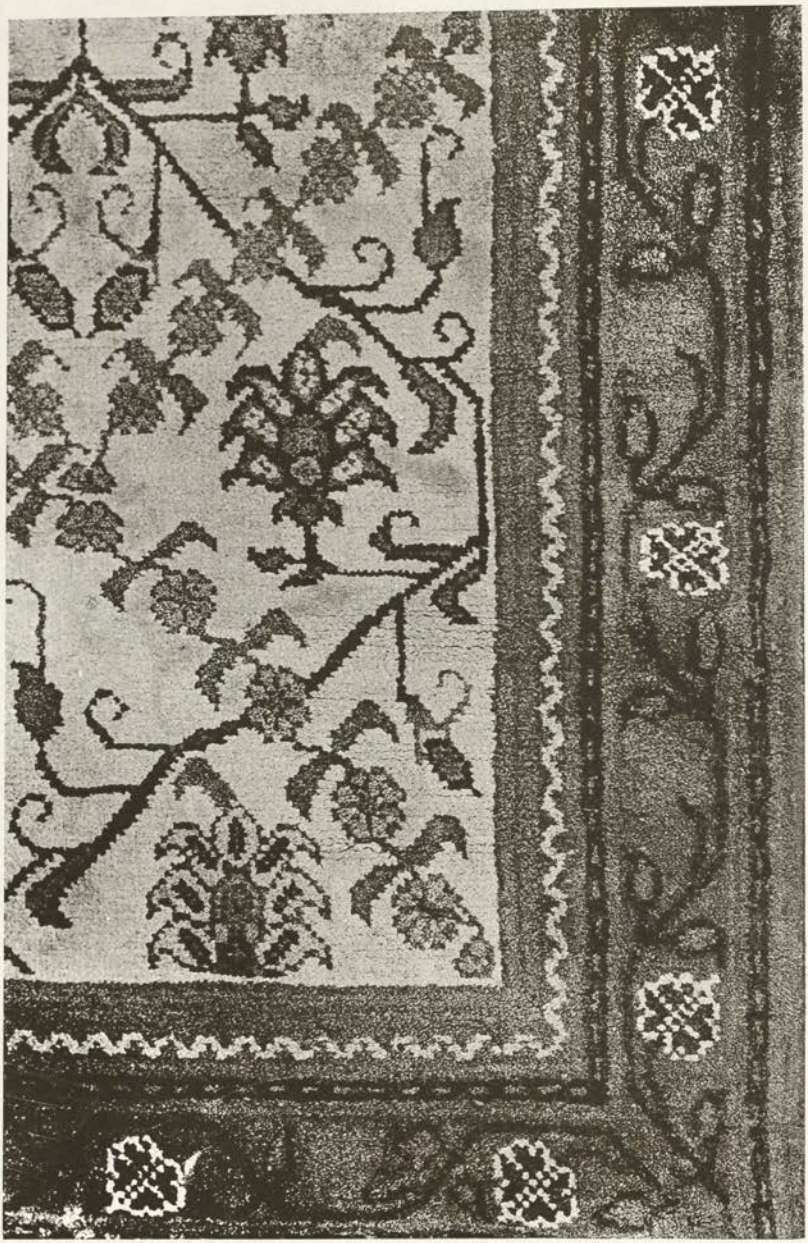
a.—RUGS WOVEN IN THE COIMBATORE CENTRAL JAIL. In coarse counts, and in, a, wool, and b, fibre.
a, is the old Shaniva Khani pattern; and b is the Gopala Khani of the Ellore weavers. Both are very old patterns.



a. b.

RUGS MADE AT ELLORE. a.—Old Ellore pattern, with a "Latch-hook" border.
b.—A DIAPER from a Warangal pattern. It is probably a debasement of a "Garden" or nosegay pattern. These are good types of "export rugs."

An undoubted Moghlai pattern. A slight variant from it is the main ornament of a rug in the Jaipur Museum made in the Bangalore Central Jail.



This much resembles an old Agra design, probably in its origin Persian, through Lahore. As now made in Bangalore, the pattern illustrated is in much less detail and gracefulness than the old Walajahnagar form of the design. Made by Messrs. Subbiah Chetty and Co., Bangalore.

The ground pattern is a form of the Birjand-Sehna-Herati variant of the well-known Feraghan pattern, arranged with a quite uncommon stiffness and harshness. The border is also a stiffly drawn form of the "Cone of flame," "Crown Jewel" or "River loop" device. Made in the Bangalore Central Jail.

XVIII. Century design, somewhat of the character of a Multan design. Pattern appears to be rarely made. Border is apparently based on the Pæony. Made in Bangalore Central Jail.

a. b. c.

RUGS MADE IN THE RAJAHMUNDRY CENTRAL JAIL.

a.—A form of an old Moghlai garden or bouquet pattern, but all the flowers are of one kind.
b.—An old form of the Ellore Aushankhani, rather spoiled by being woven in a coarse count.
c.—Apparently a local combination of the Herati fish pattern and the design of b. All these rugs are woven of fibre, not wool. Colours, unfortunately, are mostly anilines.

a b

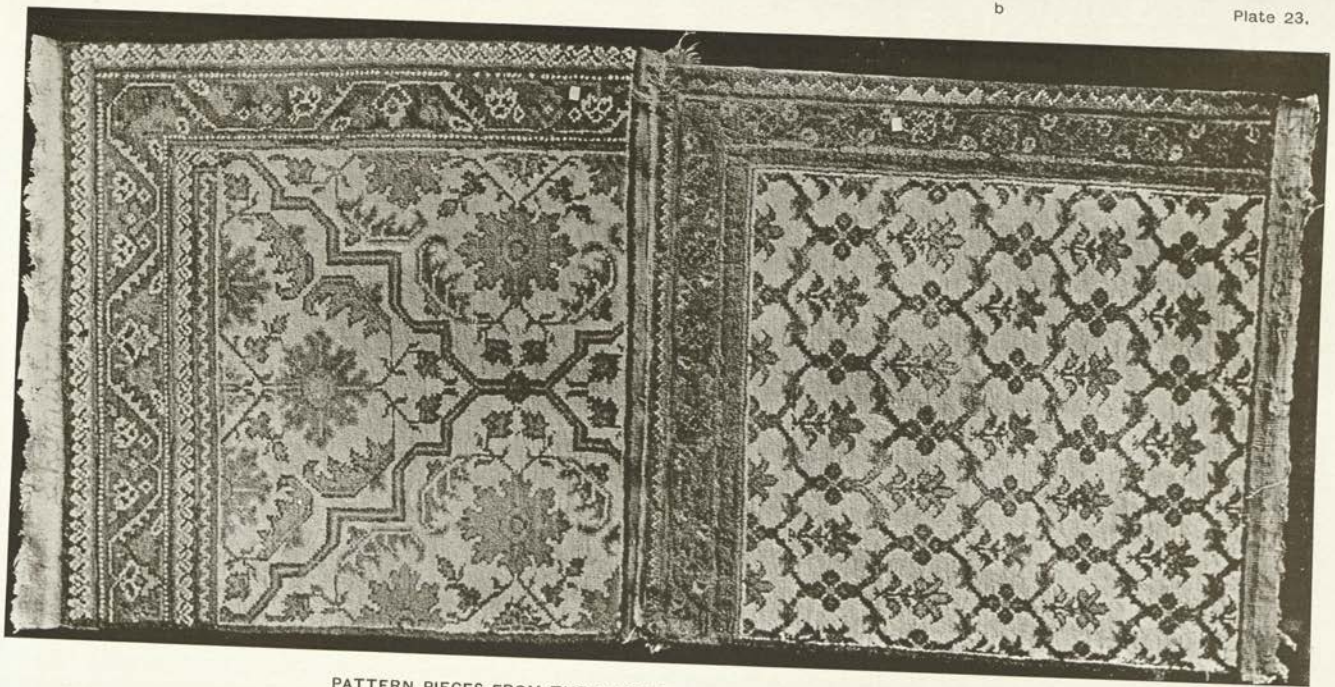
This, and Plates 23 and 24, illustrate some of the oldest and best of the Coast (Ellore and Masulipatam) designs. The photographs are from pattern pieces in the Madras Museum, which are apparently 50 or 60 years old. The colouring of all of them is good; most of the black wool has perished, owing doubtless to the presence of sulphate of iron in the dye. The wool is soft and long-stapled.

a. RAMACHANDRA RAO.—Said by the weavers to be one of the patterns that came to the Coast with the early settlers; is not in very frequent use.

b. ASHAM KHANY.—Probably the best known of the old Ellore patterns; has many points of resemblance to modern Persian and Moghul patterns.

ROYAL ASIATIC

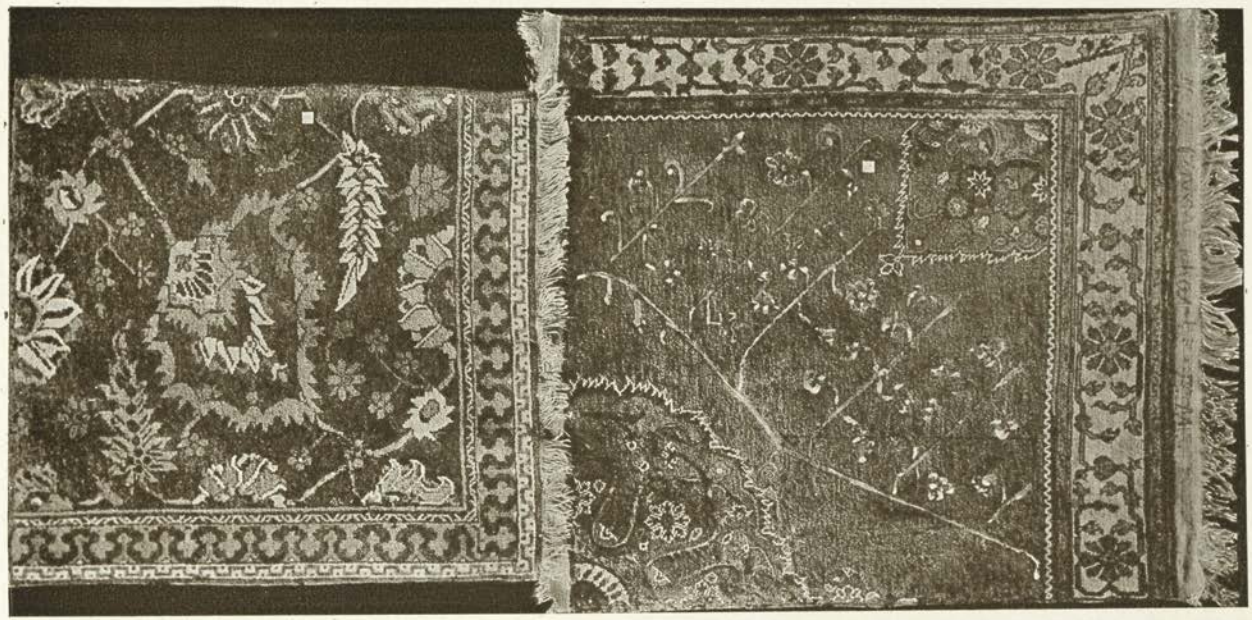
a b



PATTERN PIECES FROM THE MADRAS MUSEUM. See Plate 22.

a. SHAMVAS KHANY.—A pattern well known on the Coast and at Wanangal. Weavers say it was first made for one of the earlier Golconda kings.

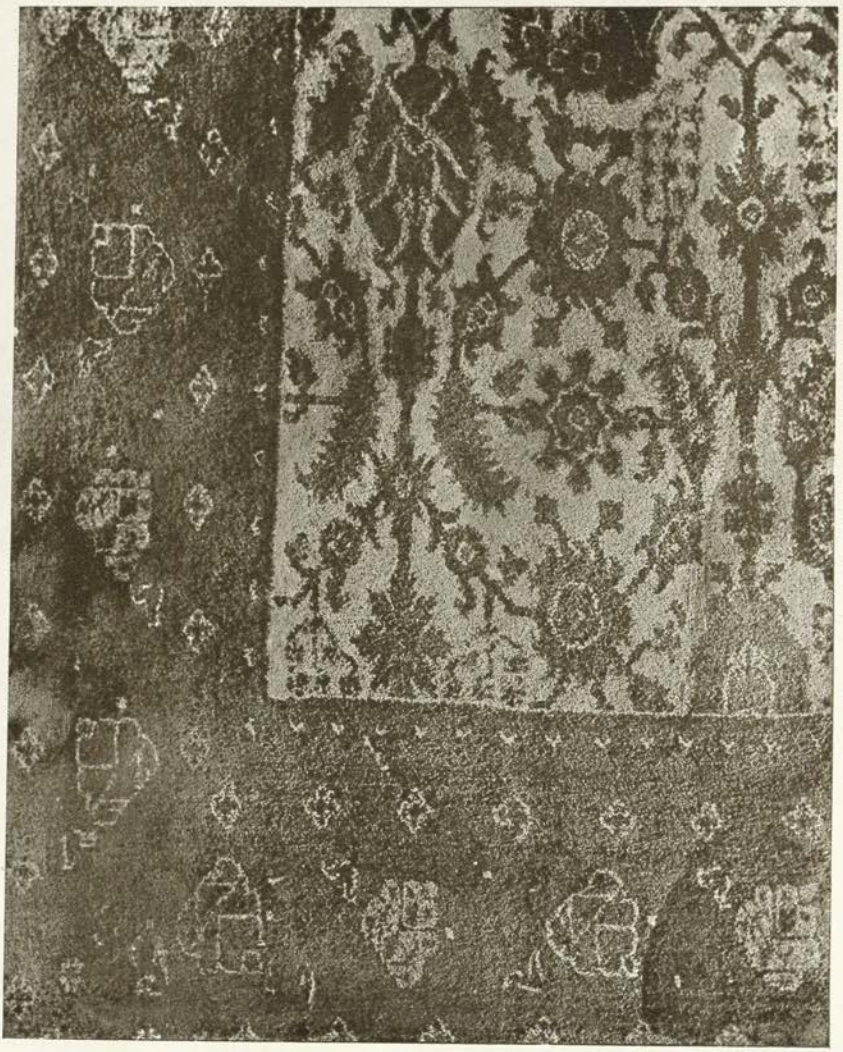
b. GOPALA RAO KHANY.—Bears some resemblance to the old diapered "Tree of life" patterns of Lahore and Persia.



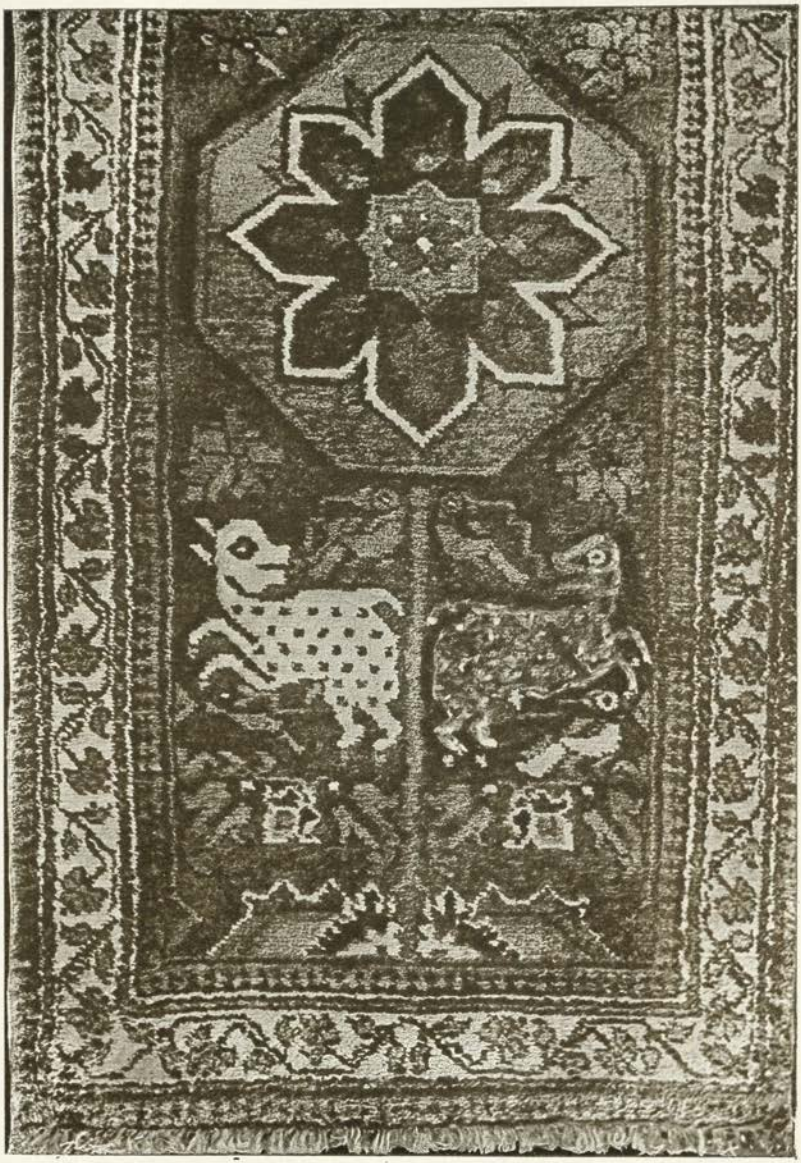
PATTERN PIECES FROM THE MADRAS MUSEUM. See Plate 22.

a. PERSIAN PATTERN.—Resembles many well known Jaipur, Lahore and Persian designs. Claimed by the weavers as one of the very oldest designs they know.

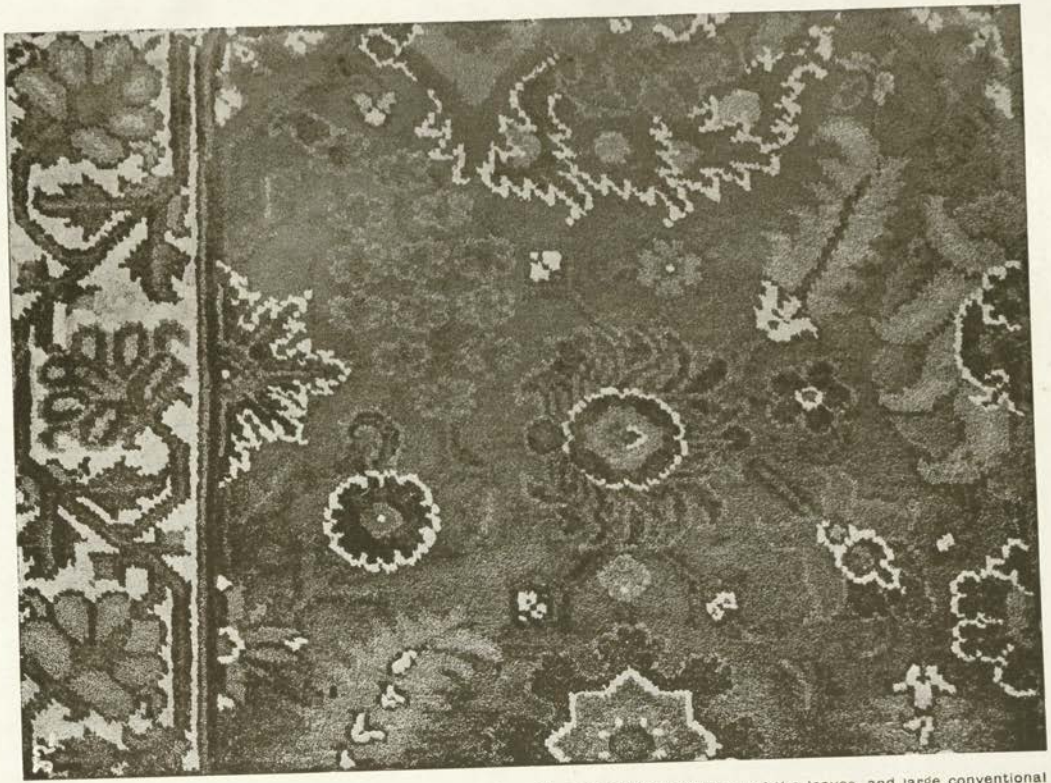
b. PINJRA PATTERN.—Originated probably in a "Konieh" design; the branched filling in one of the field is very stiff and uninteresting.



Asham Khany.—Has lost much character by weaving in a low grade, and there has been some distortion of the pattern too. Compare with Plate 22.

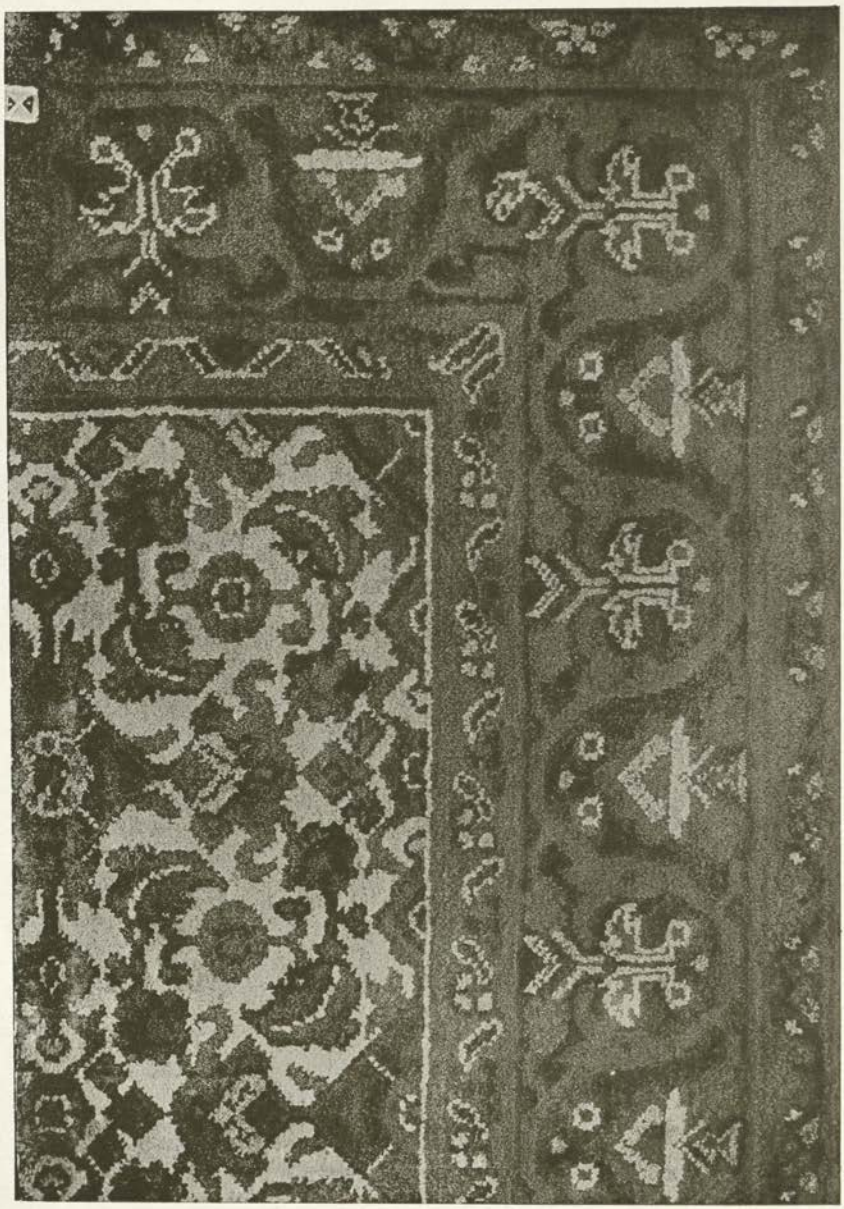


Ayyampett silk rug in very coarse weave, from a specimen in the Madras Museum. With the exception of the blues, all the colours are aniline. Has much of the character of the old Zamorin or Malabar carpets.



Another of the innumerable forms of the Aushamkhany design, with a differing arrangement of the leaves, and large conventional flowers, and with a quaint hooked leaf on the isolated rosette near the border. Made by Subbaya and Co., Bangalore City.

A South Indian pattern, said to have originated at Walajahnagar, but probably a modification of a Warangal design. The border rather suggests Turkish influence. Probably a modern introduction. Made in the Bangalore Central Jail.



A Persian form of the "Herati" design, XVI. or late XVII. Century. The border is of Moghul character. Comparison of the above with other designs after the Herati manner illustrates well the numerous local influences which have affected this well-known pattern. Made by Messrs. Subbiah Chetty and Co., of Bangalore City.

a

b

c

ROYAL ASIATIC LIBRARY OF THE BOMBAY BRANCH OF THE

Heavy rough silk cloths (Veerali or Veerakali) from the Trivandrum palaces. Usually in crimson and white or creamy yellow; probably used as elephant jhools in Travancore. They are at least 100 years old, and very uncommon. The place of their manufacture is now unknown. The patterning, especially a and b, and the border of c, suggests Persian influence.

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